

The

Communicator

June 2019



SARC



A Publication Of Surrey Amateur Radio Communications

June 2019



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The **Communicator** is a publication of Surrey Amateur Radio Communications. It appears monthly, except July and August, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

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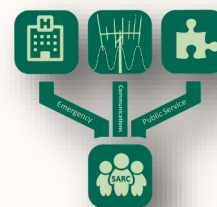
Regular readers who are not SARC members are invited to contribute a \$5 annual [donation](#) towards our Field Day fund via [PayPal](#).

SARC maintains a website at www.ve7sar.net and a Digital Communicator at ve7sar.blogspot.ca that includes recent news, past issues of The Communicator, our history, photos, videos and other information.

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On The June Cover...

Field Day is always a highlight of the Amateur Radio year. Its 24-hours where we can demonstrate that we can indeed set-up anywhere and operate independently of established infrastructure. Emergency and natural power are two bonus categories, and citrus fruit has been used in years past; see page 20 for an extreme example!





QRM

---...---

...from the Editor's Shack

*Do you have a photo or bit of SARC news to share?
An Interesting link?*

*Something to sell or something you are looking for?
eMail it to [communicator @ ve7sar.net](mailto:communicator@ve7sar.net) for inclusion in this publication.*

This is our last issue of the season before we take our Summer hiatus, and I would like to start off by thanking all our contributors over the past publication year. You have made this one of the premier Amateur Radio newsletters, not only locally or nationally, but we now receive praises and requests to reprint our articles from around the globe. The most recent from the South African Amateur Radio League national publication 'Radio ZS'.

The annual SARC Foxhunt was another success with glorious weather and a satisfying lunch. Many thanks and compliments to Amel VA7KBA and Anton VE7SSD for their efforts to make this a great event on our calendar. There is a story and video link of the event in this issue starting on page 16.

Looking ahead, Surrey Doors Open is on June 8th and will take place between 11am and 4pm at our Training Centre. We invite you to take part and to invite family, friends and neighbours. It is our opportunity to demonstrate to the public that Amateur Radio provides a valuable community service, and is not just a bunch of 'old' guys playing with radios and outdated technology.

The SARC Annual General Meeting happens on June 12th. Our members, will find an additional section at the back of this issue with the AGM agenda and meeting details. You must be a current member to vote and we will be into a new membership year, so please ensure your dues are paid up.

Of course Canada Day is on July 1st and we will have the OTC station on the air in the annual RAC Canada Day contest. If you want to observe, learn or otherwise participate we invite you to let John VA7XB know. SEPAR will be at the Surrey Canada Day festivities, and they can use your support at this family event. Contact Gord VA7GK for details.

Our social meetings will take place in lieu of monthly general meeting during July and August. Come to the OTC on the second Wednesday of the month at 7pm to participate.

Two members are having issues with their tickers. Both Heinz VA7AQ and Art VE7WAE had heart attacks in May.

Both were hospitalized but thankfully both are recovering. We send them our wishes for a complete and speedy recovery.

Over the summer you can keep up to date with news on our blog at <https://ve7sar.blogspot.ca>.

It has been a great year for Surrey Amateur Radio. Have a fabulous summer and we will be back in September!

~ John VE7TI
Communicator Editor



On the Web

ve7sar.net

Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web:

SARC Blog

ve7sar.blogspot.ca

Twitter

[@ve7sar](https://twitter.com/ve7sar)

FaceBook

[SurreyAmateurRadio](https://www.facebook.com/SurreyAmateurRadio)

Our YouTube Channel

[SurreyARC](https://www.youtube.com/SurreyARC)

SARC Photo Albums

[Web Albums](https://www.flickr.com/photos/ve7sar/)

or

tinyurl.com/SARCphoto

Many attempts to communicate are nullified by saying too much.—Robert Greenleaf

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The Rest Of The Story...

Johann Reis

Was Bell Really The First?



Johann Philipp Reis

Johann Philipp Reis (German: January 7, 1834 - January 14, 1874) was a self-taught German scientist and inventor. In 1861, he constructed the first make-and-break telephone, today called the Reis telephone.

Early life and education

Reis was born in Gelnhausen, Germany, the son of Marie Katharine (Glöckner) and Karl Sigismund Reis, a master baker. His father belonged to the Evangelical Lutheran church. Reis's mother died while he was an infant, and he was raised by his paternal grandmother, a well-read, intelligent woman. At the age of six Reis was sent to the common school of his home town of Gelnhausen. Here his talents attracted the notice of his instructors, who advised his father to extend his education at a higher college. His father died before Reis was ten years old. His grandmother and guardians placed him at Garnier's Institute, in Friedrichsdorf, where he showed a taste for languages, and acquired both French and English, as well as a stock of miscellaneous information from the library.

At the end of his fourteenth year, Reis was accepted to a Hassel Institute, at Frankfurt am Main, where he learned Latin and Italian. A love of science became apparent, and his guardians were recommended to send him to the Polytechnic School of Karlsruhe. His uncle wished him to become a merchant, and on March 1, 1850, Reis was apprenticed as a paints dealer in the establishment of J. F. Beyerbach, of

Frankfurt, against his will. He told his uncle that he would learn the business chosen for him, but would continue his preferred studies as he could.

By diligent service he won the esteem of Beyerbach, and devoted his leisure to self-improvement, taking private lessons in mathematics and physics and attending the lectures of Professor R. Bottger on mechanics at the Trade School. When his apprenticeship ended, Reis attended the Institute of Dr. Poppe, in Frankfurt. As neither history nor geography was taught there, several of the students agreed to instruct each other in these subjects. Reis undertook geography, and believed he had found his true vocation in the art of teaching. He also became a member of the Physical Society of Frankfurt.

In 1855, he completed his year of military service at Kassel, then returned to Frankfurt to qualify as a teacher of mathematics and science by means of private study and public lectures. His intention was to finish his training at the University of Heidelberg, but in the spring of 1858 he visited his old friend and master, Hofrath Garnier, who offered him a post in Garnier's Institute.

On 14 September 1859, Reis married, and shortly after he moved to Friedrichsdorf, to begin his new career as a teacher.

The telephone

Reis imagined electricity could be propagated through space, as light can, without the aid of a material conductor, and he performed some experiments on the subject. The results were described in a paper, "On the Radiation of Electricity",

which, in 1859, he mailed to Professor Poggendorff for insertion in the then well-known periodical, *Annalen der Physik*. The manuscript was rejected, to the great disappointment of the sensitive young teacher.

Reis, like Bell would later do, had studied the organs of ear and the idea of an apparatus for transmitting sound by means of electricity had floated on his mind for years. Inspired by his physics lessons he attacked the problem, and was rewarded with success. In 1860, he constructed the first prototype of a telephone, which could cover a distance of 100 meters. In 1862, he again tried to interest Poggendorff with an account of his "telephon", as he called it. His second offering was also rejected, like the first. The learned professor, it seems, regarded the transmission of speech by electricity as a chimera; Reis bitterly attributed the failure to his being "only a poor schoolmaster."

Reis had difficulty interesting people in Germany in his invention despite demonstrating it to (among others) Wilhelm von Legat, Inspector of the Royal Prussian Telegraph Corps in 1862. It aroused more interest in the United States. In 1872, when Professor Vanderwyde demonstrated it in New York.

Prior to 1947, the Reis device was tested by the British company Standard Telephones and Cables (STC). The results also confirmed it could faintly transmit and receive speech. At the time STC was bidding for a contract with Alexander Graham Bell's American Telephone and Telegraph Company, and the results were covered up by STC's chairman Sir Frank Gill to maintain Bell's reputation.

Previous experimenters

Reis monument in Gelnhausen: In 1878 European scientists declared Reis to be the telephone's inventor

Since the invention of the telephone, attention has been called to the fact that, in 1854, M. Charles Bourseul, a French telegraphist, had conceived a plan for conveying sounds and even speech by electricity:

Suppose that a man speaks near a movable disc sufficiently flexible to lose none of the vibrations of the voice; that this disc alternately makes and breaks the currents from a battery: you may have at a distance another disc which

will simultaneously execute the same vibrations. ...It is certain that, in a more or less distant future, speech will be transmitted by electricity. I have made experiments in this direction; they are delicate and demand time and patience, but the approximations obtained promise a favourable result.

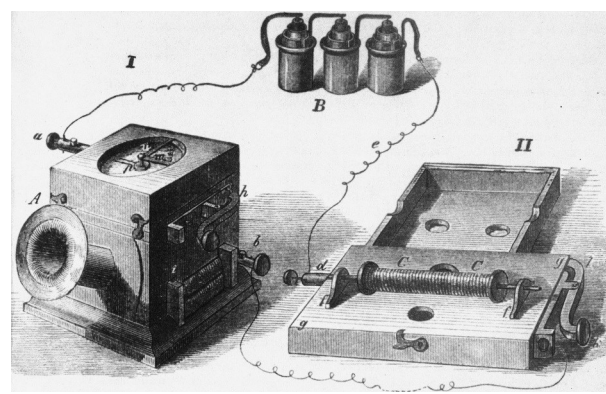
Bourseul deserves the credit of being perhaps the first to devise an electric telephone and try to make it; but Reis deserves the honor of first realising the idea as a device to transmit and receive sounds electrically.

Bourseul's idea seems to have attracted little notice at the time, and was soon forgotten. Even the Count du Moncel, who was ever ready to welcome a promising invention, evidently regarded it as a fantastic notion. It is very doubtful Reis had ever heard of it. Reis was led to conceive a similar apparatus by a study of the mechanism of the human ear, which he knew contained a membrane which vibrated due to sound waves, and communicated its vibrations through the hammer-bone behind it to the auditory nerve. It therefore occurred to him, if he made a diaphragm to imitate this membrane and caused it, by vibrating, to make and break the circuit of an electric current, he would be able through the magnetic power of the interrupted current to reproduce the original sounds at a distance.

During 1837-38 Professor Page of Massachusetts had discovered that a needle or thin bar of iron, placed in the hollow of a coil or bobbin of insulated wire, would emit an audible 'tick' at each interruption of a current, flowing in the coil, and if these separate ticks followed each other fast enough, by a rapid interruption of the current, they would run together into a continuous hum, to which he gave the name galvanic music. He also found that the pitch of this note corresponded to the rate of the current's interruption. These faint sounds were due to magnetostriction.

From these and other discoveries by Noad, Wertheim, Marrian, and others, Reis knew that if the current which had been interrupted by his vibrating diaphragm were conveyed to a

Reis' Telephone



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distance by wires and then passed through a coil like that of Page's, the iron needle would emit notes like those which had caused the oscillation of the transmitting diaphragm. Acting on this knowledge, he constructed his rudimentary telephone. Reis' prototype is now in the museum of the Reichs Post-Amt, Berlin.

Shortcomings

Another of his early transmitters was a rough model of the human ear, carved in oak, and provided with a drum which actuated a bent and pivoted lever of platinum, making it open and close a springy contact of platinum foil in the metallic circuit of the current. He devised some ten or twelve different forms, each an improvement on its predecessors, which transmitted music fairly well, and even a word or two of speech with more or less fidelity.

The discovery of the microphone by Professor Hughes has demonstrated the reason of this failure. Reis' transmitter was based on interrupting the current, and the spring was intended to close the contact after it had been opened by the shock of a vibration. So long as the sound was a musical tone it proved efficient, for a musical tone is a regular succession of vibrations. The vibrations of speech are irregular and complicated, and in order to transmit them the current has to be varied in strength without being altogether broken. The waves excited in the air by the voice should merely produce corresponding waves in the current. In short, the current ought to undulate in sympathy with the oscillations of the air. The Reis phone was poor at transmitting articulated speech, but was able to convey the pitch of the sound.

It appears from the report of Herr von Legat, an inspector with the Royal Prussian Telegraphs, which was published in 1862, Reis was quite aware of this principle, but his instrument was not well adapted to apply it. No doubt the platinum contacts he employed in the transmitter behaved

to some extent as a crude metal microphone, and hence a few words, especially familiar or expected ones, could be transmitted and distinguished at the other end of the line. If Reis' phone was adjusted so the contact points made a "loose metallic contact", they would function much like the later telephone invented by Berliner or the Hughes microphone, one form of which had iron nails in loose contact. Thus the Reis phone worked best for speech when it was slightly out of adjustment.

A history of the telephone from 1910 records that, "In the course of the Dolbear lawsuit, a Reis machine was brought into court, and created much amusement. It was able to squeak, but not to speak. Experts and professors wrestled with it in vain. It refused to transmit one intelligible sentence. 'It can speak, but it won't,' explained one of Dolbear's lawyers." It is now generally known that while a Reis machine, when clogged and out of order, would transmit a word or two in an imperfect way, it was built on the wrong lines. It was no more a telephone than a wagon is a sleigh, even though it is possible to chain the wheels and make them slide for a foot or two. Said Judge Lowell, in rendering his famous decision.

A century of Reis would never have produced a speaking telephone by mere improvement of construction. It was left for Bell to discover that the failure was due not to workmanship but to the principle which was adopted as the basis of what had to be done. ...Bell discovered a new art—that of transmitting speech by electricity, and his claim is not as broad as his invention. ...To follow Reis is to fail; but to follow Bell is to succeed.

Reis does not seem to have realized the importance of not entirely breaking the circuit of the current; at all events, his metal spring was not practical for this, for it allowed the metal contacts to jolt too far apart, and thus interrupt the electric current.

His experiments were made in a little workshop behind his home at Friedrichsdorf; and wires were run from it to an upper chamber. Another line was erected between the physical cabinet at Garnier's Institute across the playground to one of the classrooms, and there was a tradition in the school that the boys were afraid of creating an uproar in the room for fear that Philipp Reis would hear them with his "telephon".



"First telephone by Philipp Reis from 1861": a German postal stamp commemorating the centenary of Reis' achievement, issued October 1961

Publication

Reis' new invention was articulated in a lecture before the Physical Society of Frankfurt on 26 October 1861, and a description, written by himself for Jahresbericht a month or two later. It created a good deal of scientific excitement in Germany; models of it were sent abroad, to London, Dublin, Tiflis, and other places. It became a subject for popular lectures, and an article for scientific cabinets.

Reis obtained brief renown, but rejection soon set in. The Physical Society of Frankfurt turned its back on the apparatus which had given it lustre. Reis resigned in 1867, but the Free German Institute of Frankfurt, which elected him as an honorary member, also slighted the instrument as a mere "philosophical toy".

Reis believed in his invention, even if no one else did; and had he been encouraged by his peers from the beginning he might have perfected it. He was already stricken with tuberculosis, however. After Reis gave a lecture on the telephone at Gießen in 1854, Poggendorff, who was present, invited him to send a description of his instrument to the Annalen. Reis, it is said, replied: "Thank you very much, Professor, but it is too late. Now I do not want to send it. My apparatus will become known without any description in the Annalen."

Final days

Later, Reis continued his teaching and scientific studies, but his failing health had become a serious impediment. For several years it was only by the exercise of his strong will that he was able to carry on with his duties. His voice began to fail as his lung disease became more pronounced, and in the summer of 1873 he was obliged to forsake his tutoring duties for several weeks. An autumn vacation strengthened his hopes of recovery and he resumed his teaching, but it was to be the last flicker of his expiring flame. It was announced that he would show his new gravity-machine at a meeting of the Gesellschaft Deutscher Naturforscher und Ärzte (Society of German Scientists and Physicians) of Wiesbaden in September, but he was too ill to appear. In December he lay down and, after a long and painful illness, died at five o'clock in the afternoon of January 14, 1874.

In his Curriculum Vitae he wrote:

As I look back upon my life I call indeed say with the Holy Scriptures that it has been "labour and sorrow." But I have also to thank the Lord that He has given me His blessing in my calling and in my family, and has bestowed more good upon me than I have known how to ask of Him. The Lord has helped hitherto; He will help yet further.

Recognition and technological assessment

Philipp Reis was buried in the cemetery of Friedrichsdorf, and in 1878, after the introduction of the electric telephone, the members of the Physical Society of Frankfurt erected an obelisk of red sandstone bearing a medallion portrait over his grave.

Documents of 1947 in London's Science Museum later showed that after their technical adjustments, engineers from the British firm Standard Telephones and Cables (STC) found Reis' telephone dating from 1863 could transmit and "reproduce speech of good quality, but of low efficiency".

Sir Frank Gill, then chairman of STC, ordered the tests to be kept secret, as STC was then negotiating with AT&T, which had evolved from the Bell Telephone Company, created by Alexander Graham Bell. Professor Bell was generally accepted as having invented the telephone and Gill thought that evidence to the contrary might disrupt the ongoing negotiations.

Telephone invention controversies

Besides Reis and Bell, many others claimed to have invented the telephone. The result was the Gray-Bell telephone controversy, one of the United States' longest running patent interference cases, involving Bell, Thomas Alva Edison, Elisha Gray, Emil Berliner, Amos Dolbear, J. W. McDonagh, G. B. Richmond, W. L. Voeker, J. H. Irwin, and Francis Blake Jr. The case started in 1878 and was not finalized until February 27, 1901. Bell and the Bell Telephone Company triumphed in this crucial decision, as well as every one of the over 600 other court decisions related to the invention of the telephone. The Bell Telephone Company never lost a case that had proceeded to a final trial stage.

Another controversy arose over a century later when the U.S. Congress passed a resolution in 2002 recognizing Italian-American Antonio Meucci's contributions in the invention of the telephone (not for the invention of the telephone), a declaration that bore no legal or other standing at the United States Patent and Trademark Office (USPTO). Canada's Parliament quickly followed with a tit-for-tat declaration, which clarified: "...that Alexander Graham Bell of Brantford, Ont., and Baddeck, N.S., the inventor of the telephone." Prior to his death, Meucci had lost his only concluded Federal lawsuit trial related to the telephone's invention.

And that... is the rest of his story.

~

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Back to Basics

John Schouten VE7TI

From The Canadian Basic Question Bank



This month a closer look at 'Open Wire' feedline...

B-006-002-003 What kind of antenna transmission line is made of two conductors held apart by insulated rods?

- A. Open wire feedline
- B. Coaxial cable
- C. Twin lead in a plastic ribbon
- D. Twisted Pair

Several months ago we looked at coaxial cable, and we described that it was an unbalanced feedline. Coaxial cable is probably the most widely used type of feedline, used for frequencies below the microwave (SHF) range. It consists of a wire center conductor and a braided or solid metallic "shield" conductor, usually copper or aluminum surrounding it. The center conductor is separated from the outer shield by a dielectric, usually plastic foam, to keep the separation between the two conductors precisely constant. The shield is covered with an outer plastic insulation jacket. Coaxial cable's advantage is that the enclosing shield conductor isolates the cable from external electromagnetic fields, so it is very immune to interference. It is a type of *unbalanced* line, the shield conductor is usually connected to electrical ground.

This month a closer look at its *balanced* alternative: Open Wire Feedline.

In choosing a feeder system for antennas, preference is often given to the use of 50-ohm coaxial

cable. This practice is often applied when, in fact, it might be more efficient, or even more convenient, to use balanced open wire lines.

Ladder Line

Ladder line or "window line" is a variation of twin lead which is constructed similarly, except that the polyethylene webbing between the wires which holds them apart has rectangular openings ("windows") cut in it. The line consists of two insulated wires with "rungs" of plastic holding them together every few inches, giving it the appearance of a ladder. The advantage of the "windows" is that they lighten the line, and also reduce the amount of surface on which dirt and moisture can accumulate, making ladder line less vulnerable to weather-induced changes in characteristic impedance. The most common type is 450 ohm ladder line, which has a conductor spacing of about an inch.

Ladder line may also be manufactured or DIY-constructed as "open wire line" consisting of two parallel wires featuring widely spaced plastic or ceramic insulating bars and having a characteristic impedance of 600 ohms or more.

It is "balanced" in that the signal on each conductor is the same. The characteristic impedance of regular solid twin-lead is typically 300 ohms, while ladder line is commonly specified as 450 ohms. Some types of ladder line is much larger, however, consisting of two parallel wires with widely spaced (6 inches plus) plastic or ceramic insulating bars and having a characteristic impedance of 600 ohms or more. This type is more usually called "open wire line".



Above:
Open wire line

Below: Ladder line



Type	Impedance (Ω)	Velocity Factor (Vc)
twin-lead	300	82%
Ladder Line	450, 600	95%
coax	50, 75	66%

The main advantage of ladder line is its exceptionally low loss for signals in the HF band of frequencies. This can be important, since HF antennas are often large, requiring them to be installed some distance from the ham shack.

Ladder line is not used for the higher frequencies. The distance between the two wires is small relative to the wavelength of the RF signal carried on the wire. Furthermore, the RF current in one wire is equal in magnitude and opposite in direction to the RF current on the other wire (it is inverted). Thus, if both wires radiate energy equally, the radiated energies will cancel each other out and there will be near zero radiation at any distance from the wire. Twin lead is also immune to external noise or RF energies. Any unwanted external noise or unwanted RF energy induced on the wire from external energy sources will be induced in both wires at the same time and equally in magnitude and direction. At the end of the transmission line the inverted signal wire is restored to normal (non-inverted now) and added back to the original non-inverted signal wire by the receiving circuitry. Any noise will now be equal in magnitude and opposite in direction and cancel itself out.

Disadvantages are that it's more fragile than coax, cannot be installed inside conduit or near metal objects, and experiences a significant attenuation

increase when wet. These conditions greatly complicate ladder line's installation. Another issue is that a "balanced-to-unbalanced" conversion must be made, at least at the radio end, and often on both ends. An impedance conversion is also usually required, to change the 450 ohms of the cable to the 50 ohms expected by the radio. Fortunately, "baluns" (for "balanced-unbalanced") are easily available for this chore.

Twin-lead

Occasionally you may encounter another parallel wire feedline. Twin lead is used to connect FM radios and television receivers with their antennas, although it has been largely replaced in the latter application by coaxial cable, and as a feedline for low power transmitters such as amateur radio transmitters. It consists of two wire conductors running parallel to each other with a precisely constant spacing, molded in polyethylene insulating material in a flat ribbon-like cable.

Referring back to our question at the start of this 'Back To Basics', What kind of antenna transmission line is made of two conductors held apart by insulated rods The correct answer is A. Open wire feedline.

~ John VE7TI

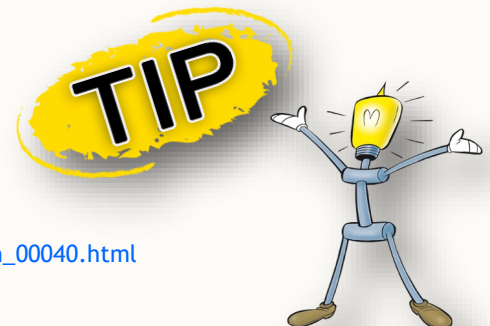
Study Links

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. <http://tinyurl.com/CanadaBasicQB>
2. There is a RIC-7 that has some explanations along with the questions. [RIC-7 2014rev08.05 with explanations.](#)
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: <https://wp.rac.ca/examiner-v2-5/>
5. There are plenty of good resources for both basic and advanced exam study courtesy of the Cold Lake Amateur Radio Society at: <http://www.clares.ca/va6hal%20training.html>

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free SARC membership!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive the The Canadian Amateur magazine for one year.



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Of Field Days Past...



Images courtesy ARRL—Reprinted with permission

Videos of SARC's Field Days past are at <https://tinyurl.com/SARC-Video>



Tidbits from the Amateur Radio World

British Columbia Amateur Radio Coordination Council 2019 Board

The Annual General Meeting of the British Columbia Amateur Radio Coordination Council (BCARCC) took place in our regular NSARC meeting room today. The meeting, chaired by President Ian Procyk, VE7HHS, was attended by 22 delegates representing 113 Amateur Radio clubs in the Province. The meeting was video-conferenced, and 12 members participated by this means.

NSEM's Deputy Director Mike Andrews VE7MPA provided an introduction, President Nick Massey VA7NRM welcomed the attendees and six NSARC members helped out with various functions before and during the meeting.

The meeting received reports from officers concerning repeater coordination issues in the past year. The number of repeaters in the province remained unchanged in the past year, about 460 in total, with the majority located in the southwest part of BC and the Okanagan Valley. To improve the accuracy of our records of repeaters, a concerted effort was made to contact the operators of the older repeaters. Over 100 repeaters were thus updated.

The Council now uses clerical help to assist in keeping repeater records updated to identify those repeaters that have been discontinued, thus providing spectrum for new repeater users.

Directors and Officers elected to serve for the next year were: President - Doug McBurney VA7DJ (Delta ARC); Vice-President - Robert Beaupre VE7RBE (Sun Coast ARC); Past-President Ian Procyk, VE7HHS (Coquitlam ARC); Secretary - Ed

Frazer, VE7EF (Point Grey ARC); Treasurer - Urey Chan VE7URE (Richmond ARC); Chief Coordinator - George Merchant, VE7QH (North Shore ARC); Brian Leckie VA7BXL was elected Director representing South Vancouver Island.

For more about the Council, go to their website: <https://bcarcc.org/>

~ Story & photo courtesy of Ed Frazer VE7EF

Standing L-R: President: Doug McBurney VA7DJ of Delta ARC;
Director Brian Leckie VA7BXL of Saanich Emergency Program;
Vice-President Robert Beaupre VE7RBE of Sun Coast ARC;
Treasurer Urey Chan VE7URE of Richmond ARC.

Seated L-R: Chief Coordinator George Merchant VE7QH;
Secretary Ed Frazer VE7EF of Pt. Grey ARC;
Past-President Ian Procyk VE7HHS of Coquitlam ARC



June 2019

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Sun	Mon	Tue	Wed	Thu	Fri	Sat
	For details on all SARC events, go to ve7sar.net For details on all SEPARS events, go to separ.shutterfly.com/calendar					1 08-1000 SARC Social: Kalmar Family Restaurant CONTEST: Kentucky QSO Party (all modes)
2 CONTEST: Kentucky QSO Party (all modes)	3	4 1930 SEPAR Net 2000 SARC Net	5	6	7	8 08-1000 SARC Social: Kalmar Family Restaurant 11am-4pm Surrey Doors Open
9	10	11 1930 SEPAR Net 2000 SARC Net	12 1900 SARC Annual General Meeting	13	14	15 08-1000 SARC Social: Kalmar Family Restaurant CONTEST: WV QSO Party (all modes) All Asian DX (CW)
16 Father's Day CONTEST: WV QSO Party (all modes) All Asian DX (CW)	17	18 1930 SEPAR Net 2000 SARC Net	19	20	21 Pre Set-up Breakfast 0800-0930 Kalmar Family Restaurant Set-up 11:00	22 Field Day 11:00 Start—24 hrs
23 Field Day Take-down 11:00	24	25 1930 SEPAR Net 2000 SARC Net	26 1900 SARC Exec Meeting	27	28	29 08-1000 SARC Social: Kalmar Family Restaurant

Contest Details: <http://hornucopia.com/contestcal/contestcal.html>



Page 13—News You Can Lose

The Lighter Side of Amateur Radio

Game of Rohns Coming To A TV Near You

By WBØRUR, on the scene

HOLLYWOOD, Calif. – Entertainment producer Mark Cornett is announcing a new amateur radio themed television series scheduled to debut this fall on the American Television Channel. “Game of Rohns” will take place in the fictional New England town of Queen’s Landing, Rhode Island.

The show simultaneously follows three New England ham radio operators as they vie to erect the tallest towers in the hamlet; overcoming negative community reactions, city building and land use codes, financial challenges and other obstacles.

Cornett says he is excited about beginning production.

“It’s a remarkable story line with fame, fortune, tragedy, success and dragons. Well, no dragons. But it’s still exciting!”

The pilot episode introduces viewers to patriarch Eddie Stark, as he attempts to raise a 30-foot push-up pole with a UHF/VHF antenna mounted on top. Strong winds and violent winter weather bring the mast tumbling to the ground on the property of Stark’s neighbor, Tyrone Bannister, with whom Stark has a long-standing feud.



Both men decide to erect the “tallest radio tower ye may have ever had the privilege of climbing”; each attempting to out-do the other.

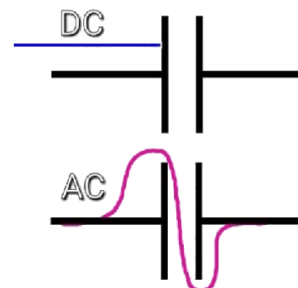
Check your local cable or satellite provider for times and dates.

Cornett says he is developing two additional amateur radio related shows for ATC, a comedy called “That Callsign Is Not Valid” and a documentary about obsessive compulsive disorder called “AGAIN AGAIN.”

~ Ham Hijinks

Things you may not know...

Why AC current passes through a capacitor





At The Last SARC Meeting...

General Meeting

Wednesday, May 8, 2019

Attendees: 25

Meeting Start: 7:03pm

Location: BC Emergency Management
(Surrey PREOC)

Announcements

President Stan Williams VA7NF welcomed the group to the meeting and asked for any health or welfare reports. None heard.

Financial Report

Treasurer Scott Hawrelak VE7HA provided the financial report and noted that membership dues for fiscal year 2019/2020 were being collected tonight and are required to vote at the June AGM. Name badges for those who recently ordered them are available tonight. The fall badge order will be adjusted to change from "Club" to "Communications". Patches/crests say "Club" and a few are still available. Nothing has been decided yet on getting new ones made with the name change.

Committee Reports

Fox Hunt

Anton James VE7SSD reported that this year's Fox Hunt has 22 participants registered already, with 28-30 attending the barbeque. Briefing will begin at 8:30 am and participants will head out in staggered groups starting at 10 am. It will be an 80 m band event only. A signup sheet was passed around again to record interest. A few second generation prototype 80m receivers, built by Les

Tocko VA7OM, were made available for \$120 each.

Gaming Grant

John Brodie VA7XB reported that the gaming account balance must be spent by fiscal year end (May 30). He is starting to put together the next gaming grant application and looking for input from the group as soon as possible to allow prompt submission early in July.

Public Service Group

Don Hamilton VA7GL stated that Gord Kirk VA7GK has put out a notice about the Grand Slam (Earthquake Audit) from the City of Vancouver to see how prepared they are. Groups from Surrey, Delta, Coquitlam are being invited to attend. It's this Friday so Don needs to know by Friday regarding those interested in attending as an observer.

Don advised that a Kenwood DM710G, equipped with packet for digital messaging and APRS, along with a Samlex 12v charger have been purchased. He will be ordering 15 Arduinos for a TNC build kit soon. This TNC kit was displayed in the Feb Communicator and more information will be provided soon. Two Yaesu HT radios were purchased that have FM and Fusion. A couple of headsets and a Cushcraft beam antenna were also purchased for later installation on a tower.

May 25th is the Hyack Parade and Ken Clarke VE7BC is looking for volunteers. May 26th is a MS Walk in Langley but it is understood that a sufficient number of volunteers have stepped up.

National Parks on the Air (NPOTA)

Stan VA7NF noted that Fort Langley National Historic Site will be assigned a special event callsign and Fred Orsetti VE7IO is collecting names to operate the station. The plan is to set up bigfoot tower with a beam plus an 80m/40m wire for the event.

Surrey Doors Open

John Schouten VE7TI announced that Doors Open will be held at the OTC on June 8th from 11 am to 4 pm, with the setup same as last year. He is looking for volunteers.

Field Day Planning

Following coffee break, Jason Biggin VA7ITJ reviewed Field Day planning.

Stan VA7NF moved that we purchase the list of equipment proposed by Jason for Field Day. Seconded by Don H and the motion carried.

Sheldon Ward VA7XH suggested that it would be more economical to buy a 500 ft roll of LMR400 (not ultraflex) rather than three 100 ft lengths of LMR400UF.

The decision was deferred to the Executive. A motion was made for authorization to spend up to \$1000 for FD, and the motion carried.

John VA7XB volunteered to lead construction of a 40-80 NVIS antenna.

In response to a question from Anton VE7SSD regarding who will be responsible for receiving the ARRL bulletin message, the response was that typically Fred Orsetti VE7IO takes care of it and will be requested again.

Anton also asked who will be contacting the Section Manager. No decision.

Thursday May 30 is tentatively planned for the next Field Day planning at the OTC.

Meeting Adjourned: 8:51pm

~ Jeremy Morse VE7TMY



Field Day is only a couple of weeks away!



The 2019 SARC Fox Hunt

Anton James VE7SSD

Our Annual Hidden Transmitter Hunt

The annual [SARC "Fox Hunt"](#) has long been an established event on our calendar and was held on Saturday, May 11th in the now usual location of Crescent Park in South Surrey. A fox is a hidden transmitter. Fox hunting is a recognized Radiosport, and it has been compared to the 'Amazing Race' for Amateur Radio enthusiasts, but instead of getting clues, we use radio direction finding techniques to search for the 5 transmitters hidden somewhere in a large forested park. When one is found, by following a Morse code beacon, we use the identifying paper punch to verify the location. The faster time back to the start with all 5 foxes is the winner. There are annual [World ARDF Championships](#) for fox hunting.



SARC members, guests and friends have supported this event and it continues to grow in popularity. This year there were with 27 Hams participating in the actual hunt, along with 5 unlicensed 'friends'. It was also encouraging that we had several young people participating.

It was a dry and sunny day, participants were divided up into teams of "Expert" and "Novice" class. Where there were not enough receivers, participants "buddy-up" to share equipment. After a brief intro and training session by Amel VA7KBA

and Jeremy VE7TMY, and with adrenaline flowing, the groups were enthusiastically dispatched in 10 minute intervals. Much fun was had by all.

With the popularity of 80m, we did away with the 2m foxes and five 80m foxes were hidden throughout the park. Participants were allocated 90 minutes to find them.

The social half of the event was the informal BBQ, providing an opportunity to engage in stories, an exchange of lessons learned and challenges overcome. Warm camaraderie prevailed over burgers and hot dogs.

In any planned event such as this, there are many moving parts and I extend recognition and greatest of thanks to Amel VA7KBA, Jan Vozenilek VA7VJ, John Schouten VE7TI who handled all the set up and the technical aspects of the "foxes". Much appreciation to Brenda (XYL of Anton VE7SSD) for food shopping, John Brodie VA7XB for ice and the BBQ and the able chefs, Stan VA7NF, Nell VE7PE and Pam VE7PFH for expertly staffing the grill. Special mention is made of Les Tocko VA7OM, who, through a conflict in schedule, was unable to attend. His support throughout the year is acknowledged.

An informal "prize" ceremony, bragging rights and the 'crystal fox' trophy were awarded to the winner, Jan Vozenilek VA7VJ. The stuffed musical bunny was awarded to Jeremy Morse VE7TMY.

Mark your calendars (tentatively) for the same weekend next year, Saturday May 16th, 2020, as we look forward to another annual SARC FoxHunt.

~ Fox-Hunt Coordinator
Anton James VE7SSD



Expert class

1st Jan Vozenilek VA7VJ
5 foxes 44mins
2nd Henry Dahl VE7HRY 5
foxes 50.5m

Novice class

1st Jeremy Morse VE7TMY
5 foxes 78:50 mins
2nd Ken Patenaude (Unl)
5 foxes 80 :20mins
3rd Paula Struthers VE7PSP
5 foxes 80:45 mins

A video of the event is
available for viewing at:

<http://bit.ly/FoxHunt2019>

[More photos here](#)

NORTH AMERICAN AMATEUR RADIO fieldday

24-HOUR EMERGENCY EXERCISE & COMPETITION

FREE EVENT • OPEN TO THE PUBLIC

SATURDAY JUNE 22 11am—SUNDAY JUNE 23 11am

Former Grandview School Grounds • 176th Street & 20th Avenue, Surrey



We provide emergency communications services to the Surrey Emergency Program. Come and explore the exciting world of Amateur Radio



Field Day 2019

Jason Biggin VA7ITJ



There are three values I bestow on my daughter when I drive her to school, a sporting event, or similar. Before she departs, I frequently tell her, "have fun, learn lots, and be safe." More often than not, this earns me a roll of the eyes from my now 16-year-old. She is very used to this, however, as I have been imparting these faiths for most of her life. It is these items I wish for her always as I believe they will be the most rewarding. For our group and visitors at this year's Field day, I wish the same.

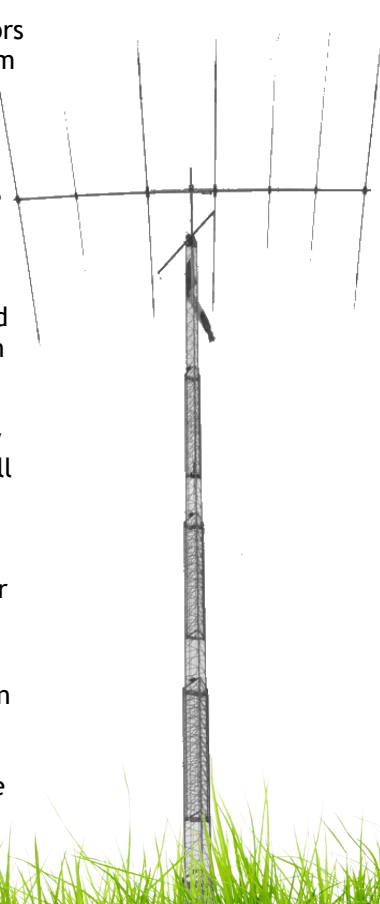
At our first meeting to organize this year's activities, the field day crew defined the goals we wished to address. Here we brainstormed the various items and determined our priorities. One item proposed was "to have fun," which I excluded from the list as I felt that fun is weaved into everything we do. Looking back, I believe I should not have been so pragmatic. There is merit in stating that an activity should be fun as it recognizes it's value. With this, I certainly hope everyone enjoys themselves: working together, operating, visiting and hosting.

Field day is an excellent opportunity to discover as well as share your knowledge. For this finite period, most of our equipment is deployed at an alternate location. Also, some essential but rarely used items are implemented — the most significant being our 100' tower (Big Foot), and long wire antennas. Considerable effort and care are exerted to deploy and use these items. Be encouraged to observe and engage in any

of these activities to strengthen our collective understanding. This year we will have 3 HF operating stations with shared access to antennas resonant at 10-15-20-40-80-160 meters. Each HF station will be capable of CW, SSB and data modes. Also, led by John VE7TI, satellite stations will be worked to earn extra points. Alex VE7DXW will be demonstrating his RF Seismograph. A VHF+ station will also be available in the SEPAR trailer for demonstration and use by visitors. For all who are interested, there will be much to take in. For visitors who want to learn more, encourage them to sign up for the Fall basic training course.

We must all be mindful of our safety to minimize the chance of injury to anyone on site. Field day involves the deployment of equipment that can pose significant risks. Heavy machinery, batteries, guy lines, generators, fuel and high power transceivers are the common items that can be threatening. Please recognize hazards and take action to address. We will have posted our safety rules, and Nell VA7PE & Ralph VA7UB will provide guidance when needed and are fully empowered to decide on matters. Most of us will recognize these threats; however, first-time visitors will need our support. Your care and attention can help ensure a safe event for all.

This year we will be at the same location as last, the former Grandview Heights school, located at 176th Street and 20th Avenue. Setup will start on Friday, June



June 2019



21st after fueling up at the Kalmar restaurant, located on King George at 80th Avenue. Your assistance to help with installation and teardown is much appreciated. Operations officially start at 1100hrs PDT, Saturday, June 22nd and continue for 24 hours. To request time on an HF station, please visit <https://www.surveymonkey.com/r/MT6TH2F>. There will also be an opportunity at our next meeting to submit your request. I hope to see you at Field Day, and at the risk of receiving eye-rolls, I hope you have fun, learn lots and be safe!

~Jason VA7ITJ



Field Day

Kevin McQuiggin VE7ZD/K7MCQ

Memories Of Field Days Past

In 1999, John VE7TI and I, and my wife Laura VE7LPM were thinking about how we could mount an effective entry for VECTOR's Queen Elizabeth Park Field Day (FD) in the "natural power" category. We wanted to think of something different. Somehow we got onto lemon-powered electrical gadgets that we had played with as kids, and started wondering if we could "scale that up" to power a handheld radio which we could use to make the requisite 3 or 5 contacts on FD.

Laura and I decided that we could do it, so I conducted research on the configuration of lemon batteries for the required voltage and current to drive a handheld while Laura looked after logistics. We got in touch with a local Safeway store and through some effective lobbying about the positive nature of amateur radio,

we got them to donate a large crate of lemons to our effort.

Tests were required to find both the necessary "lemon configuration" (series, parallel, or a combination?) and to refine construction of the metal elements of the battery, and its physical layout. Our basement was to be the "lab" where we would construct the prototype.

We decided to use copper and zinc as the two terminals of the battery. Each lemon

would be "stabbed" with two electrodes, and their dissimilar metal would allow current to flow from the copper to the zinc terminal. I made a few prototypes, and the voltage was alright at about 3 volts, but the current capability of the battery was extremely low. We would string about 4 lemons in series to get the ~12 volts necessary for the radio, but a huge set of these smaller batteries would be necessary to generate the required current for the radio. Like, about 2 sets of 50 rows of 4 lemons each. That's 400 lemons!

It was evolving into a big project, but I was (maybe stupidly) undeterred, and I forged ahead. I bought rolls of copper and zinc, about 2 cm wide, from the hardware store, and cut them into 10-15 cm little strips to make the electrodes for the 400 lemons.

This didn't go so well, as the metal was very sharp, and I suffered a number of small cuts on my fingers that were made much more painful due to the lemon juice seeping into the cuts when I stabbed the lemons with the strips. Ouch!

The battery grew and grew in the basement, and Laura realized that if I completed it there that it would be a problem getting it into the car for transport to the FD site.

Voltage and current were getting up there, however, so I was confident that this unusual natural power entry would work. I did have some concerns that developed into big worries, as we had noticed that the lemons weren't taking their impalement well. They were looking a bit worse for wear and a number of them had started to rot. The stench was not entirely



unpleasant, however, so we continued: FD was a couple of days away by this point so I figured that the lemons would last “long enough”.

John of course was not aware of these complexities and his frequent inquiries about “how is the battery idea coming along?” were duly noted. I didn’t want to alarm him!

The big day came. Laura and I disassembled the battery into segments and packed it into the back of my old reliable Toyota pickup. A number of the lemons had, by now, the look of laboratory specimens that would be great for harvesting penicillin, but they were still producing voltage, so away they went.

Re-deployment of the battery at the FD site went well, although I was tired of having sticky, stinging fingers for the past week. We assembled the battery on a couple of tables, joined the segments with long copper and zinc strips, and we had juice!

The moment of truth came, FD started, and we found a volunteer who was willing to hook his 2M handheld up to this citric contraption. To our amazement, his handheld came to life! We knew that the battery’s life would be limited under load, so he had to act quickly for those natural power QSOs. He switched to 146.52 MHz, simplex, and called CQ. Yahoo! We got a response from another local club, and our first QSO was in the bag.

A setback occurred, however, when we went on to try for the additional contacts. Even on low power, the handheld had largely drained the lemons, and while the voltage stayed high, their current sourcing capability had dropped off considerably. Further QSOs failed.

We were saved when another club member (I can’t remember his name, unfortunately) suggested that we use the lemons to charge up a couple of large electrolytic capacitors that he happened to have in his vehicle. I thought “huh?” - it was FD after all, and people bring all this odd stuff that they think they might need - but spare electrolytic capacitors? What luck!

The fellow retrieved his electrolytics, we discharged them through (safe) shorting, placed them in parallel and hooked the 400-strong lemon army to them. Then we waited for the capacitors to charge up. How long to wait? We had no idea, so we left them for about 15 minutes. Personally, I didn’t think this would work, but as the original plan had gone sour, it was worth a try.

We removed the electrolytics from the lemon battery, and our handheld volunteer again offered to hook them to his radio and then try for 4 very fast QSOs. A braver soul was not on our FD site. This time we deployed some other hams with handhelds in the local area so that they would be available for a quick QSO.

Somewhat to my amazement, it worked! We made the 3 or 4 additional QSOs necessary to claim the “natural power” bonus using the electrolytic capacitors, which

now exuded a fresh, lemony scent, and Laura and I basked in the glory of having achieved a really creative FD natural power, point bonus. There was the usual Back-slapping and some silly FD-fueled frivolity around the FD tent.

What were we going to do with the lemon battery? Recycling was a fairly new idea in 1999, but we thought that we would just use the lemons in our garden or on our compost heap, so we were on the right track.

I was tired. I snoozed for a bit, as one tends to do on FD, but when I got up and about again, I noticed a new sign by the FD tent. “FREE LEMONADE”. Laura had disassembled the battery, removed the metal strips, tossed the rotten lemons, squeezed the heck out of the remaining ones, added handfuls of sugar, ice and water, and made a huge tub of lemonade in a (brand new and clean) garbage can we had bought for the FD operation. It was fantastic! Not too sweet, and icy cold on a very hot day. Everyone had a big mug.

It was a great end to this successful “natural power” experiment!

After FD, we wondered what other innovative natural power source we could use for VECTOR’s next FD event. How could we top this year’s achievement? I pondered this for several weeks. Then it hit me: “nuclear power!” That would make the cover of QST for sure!

I proposed this new idea, of recovering radioactive material from (probably) a large number of old smoke detectors, or another natural source of radioactive material, and then using the consolidated material’s heat to generate current using a common thermocouple, and storing the charge in a battery, to John and Laura. They were intrigued, but not enthusiastic. John was concerned that our group would get into trouble with one of our main sponsors, the City of Vancouver, which was at that time a very outspoken “Nuclear-Free Zone”. The idea never went anywhere. A good thing, probably!

~ Kevin
VE7ZD / K7MCQ



June 2019

The Contest Contender

John Brodie VA7XB

An NVIS Antenna for Field Day



This issue of the Communicator is focused on Field Day so I am going to make a few observations about a proposal to set up an NVIS antenna at our FD location and how it might be modified for our use.

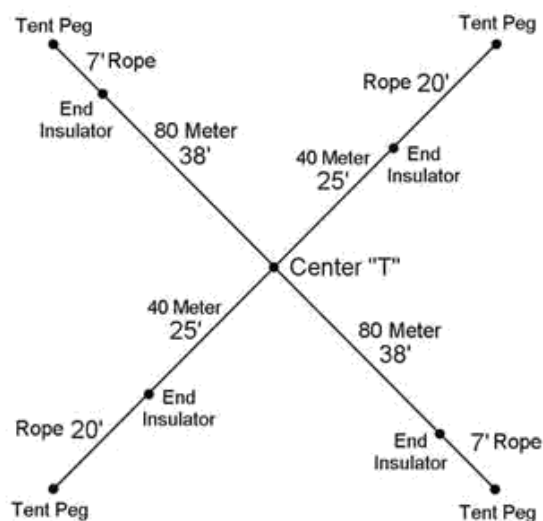
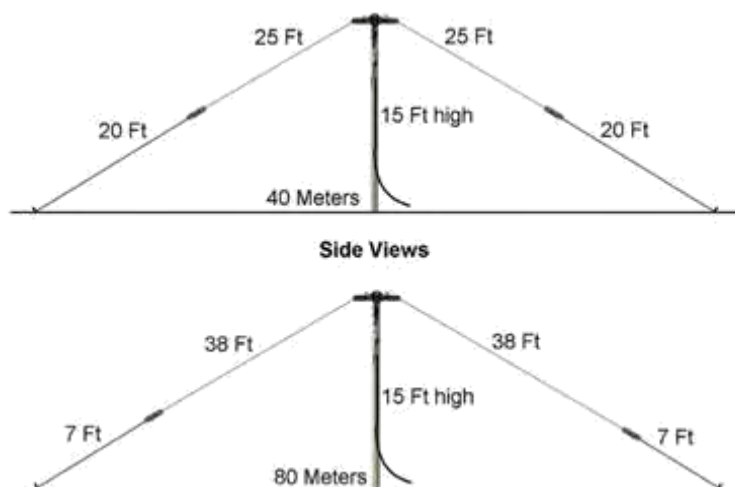
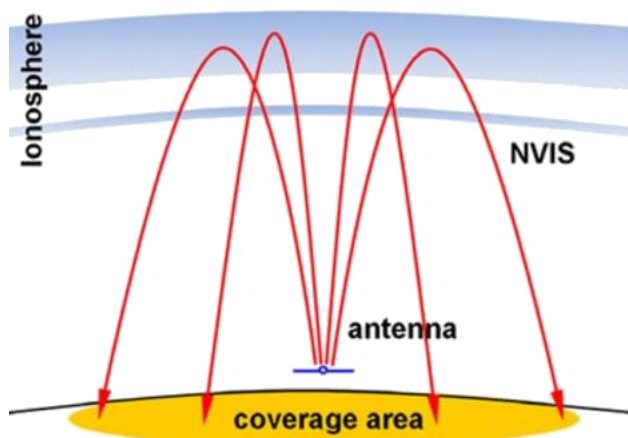
NVIS as most of us know, stands for “near vertical incident skywave”.

At a basic level, an NVIS antenna deliberately designed to send signals (typically 40 and 80 m) in a near-vertical direction into the ionosphere will result in these signals penetrating the D-layer and being reflected downward off the F-layer to be heard at

locations close to the source. Why would we want to do that? Because it overcomes the normal limitation of what is commonly called the “skip zone” near the source, where no signals can be heard. At Field Day we wish to communicate with “local” stations (i.e. within a few hundred miles). Emergency responders might have a similar need.

NVIS antennas are typically close to the ground. For Field Day, an NVIS antenna for nearby contacts will supplement a beam or wire antenna designed to cover more distant communication.

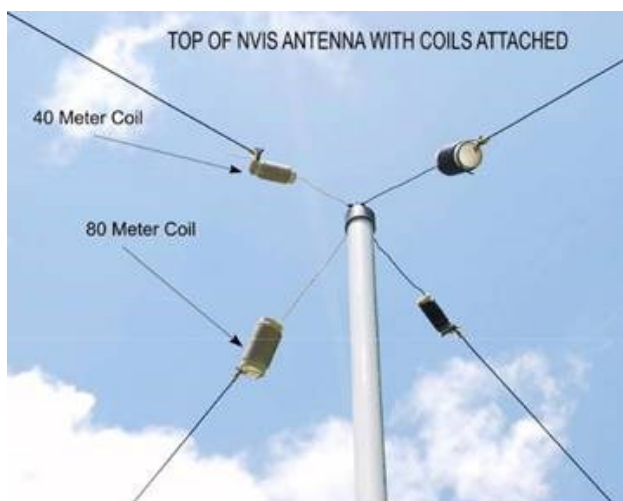
The military uses NVIS antennas for the same reason. In researching NVIS you will come across the AS-2259/GR which is described at <http://arri-ohio.org/SEC/WP-NVIS-Rev3.pdf>. It utilizes shortened elements in an inverted vee cross pattern raised to 15 ft above the ground with a single pole at the apex.



I had some reservations about this antenna because:

1. The elements are too short for 40 and 80m so the antenna will be way off resonance and therefore cannot be expected to tune with a conventional radio tuner (which typically needs to see an swr of 3.0 or less).
2. The antenna will require the use of a wide-range external tuner. Without an auto tuner, every frequency move within the band would likely require manual re-tuning, yet one more challenge under the demands of FD productivity.
3. Even when the antenna is successfully matched the coax losses will be large, given the high swr on the feedline between the antenna and the tuner.

N3AE and N3IDX resolved this as explained here: <http://arrrl-ohio.org/SEC/nvis/Modified%20AS-2259%20NVIS%20Antenna.pdf>. Their solution was to effectively lengthen the elements by adding coils in series with the wires as shown below. By this means their EZNEC model predicted the swr could be reduced to 2:1 or lower on both 40 and 80 m, but not necessarily over the entire bands.



Whereas I would have placed the coils at the far end of the elements rather than near the feedpoint where the radiating current is highest, the addition of coils brought the elements approximately into resonance and

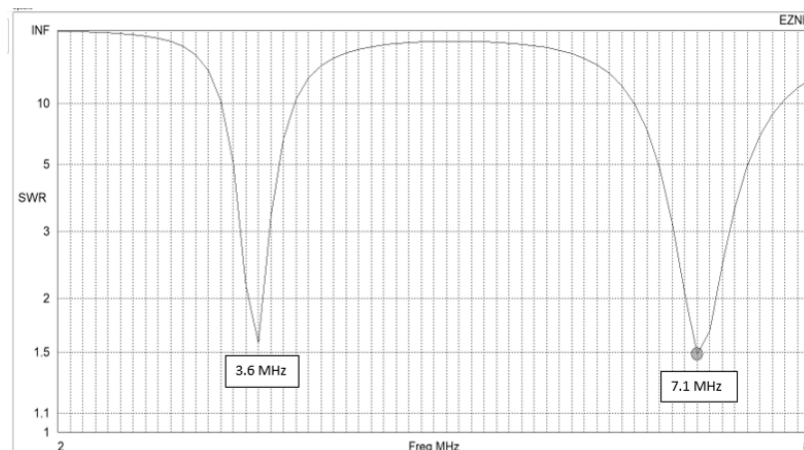
would seem to represent a significant improvement to the AS-2259/GR.

However, there might be an even better solution: why not use a full length elements, if lack of space is not a problem? Let's see what EZNEC modeling software has to say about this.

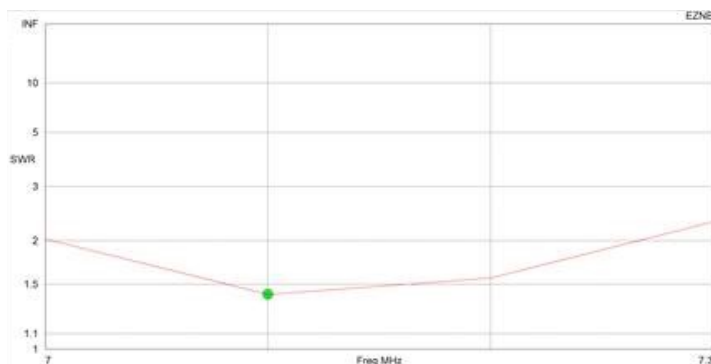
Since the allowable number of segments in the demo version of EZNEC appeared insufficient for this exercise, I broke down and purchased the full version of EZNEC v 6.0.

Below are the best EZNEC model SWR results and vertical propagation plot I was able to create for 40 and 80 m. under the following assumptions:

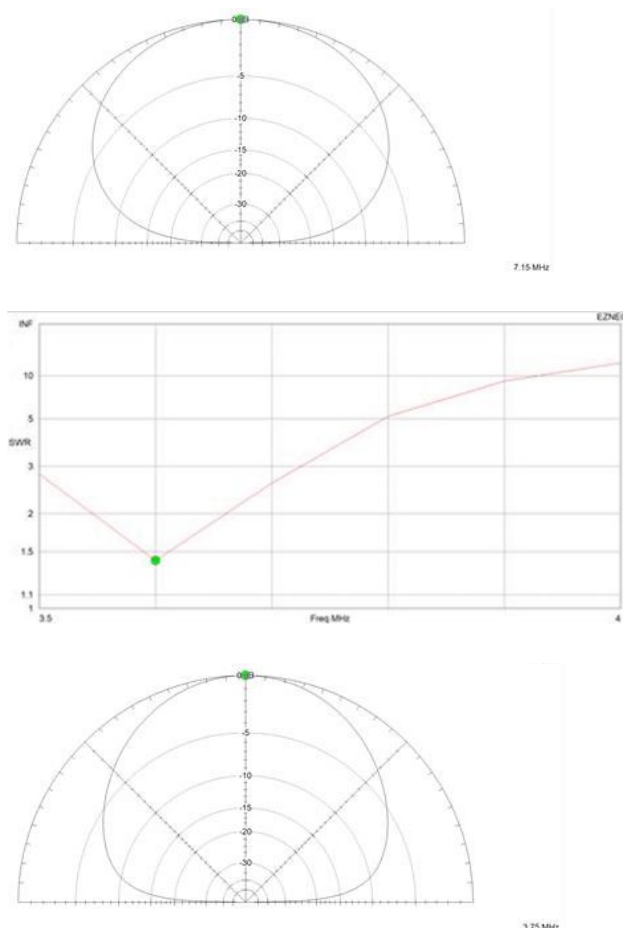
- Height at center: 15 ft
- Height at end: 5 ft
- Length of each 40 m element: 32.0 ft
- Length of each 80 m element: 65.0 ft
- Soil conditions: average, pastoral heavy clay



Looking at just the 40 and 80 m bands, we see:



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It appears from the full-length element model that the 40m band would be tunable across the entire band from 7.0 to 7.3 MHz. However, the tunable portion of the 80 m band is only 3.50 to 3.63 MHz.

In order to utilize the entire 80 m band, we would still need an external wide-range tuner to bring the swr into range, and use the radio's tuner to fine-tune that setting as we move about the band when operating. If we do this right, once the external tuner is set for the middle of a given band, it shouldn't be necessary to change its settings.

As can be seen from the elevation propagation plots, the radiation is indeed mostly upwards, as desired.

At the time of writing, the antenna had not been constructed. So it will be an interesting exercise to see how well the as-built version compares with the model. The feedline to be used is RG213 coax (rather than RG8X) through a 1:1 current balun at the apex, which also provides a convenient means of attachment of the dipole wires to the coax. Use of insulated wire should allow for safety even if the wire ends are within reach.

With this configuration, we should have an impedance tunable by the radio's tuner on both bands, moderate swr on the feedline and at the radio, and minimal coax losses. We shall see.

~ John VA7XB



Tariq VE7KPK is one of our recent Basic class grads and wanted to try out contesting. Here he is being tutored by John VE7TI.

John VA7XB met up with an old friend and past SARC member while RV-ing on the Island. John McFarlane VE7AXU hosted him at their place in Qualicum Beach.





Radio Ramblings

Kevin McQuiggin VE7ZD/K7MCQ

Subcarriers and Broadcast FM Radio

This month and next I'd like to "talk technical" and cover something that us as hams should probably know a bit about, as it concerns how broadcast FM radio signals are modulated and demodulated. When members of the public ask us general questions about radio, we want to be well-informed and be able to answer their questions.

In particular, there are two "subcarriers" embedded in broadcast FM signals that carry interesting additional information to the normal stereo programming we enjoy every day. Let's talk about these signals in some depth.

While we don't normally use subcarriers in our amateur work, the subject is nonetheless interesting, and you can learn a lot from studying it. Looking at these extra "payloads" in broadcast FM signals will illustrate how the basic modulation and demodulation theory we already know as hams can be applied to, in effect, "build a signal" containing more than one data stream.

You will even be able to build a simple receiver in gnuradio to extract one of these extra signals and listen to its content. Don't worry, I will provide the gnuradio "flowgraph" and you can modify it to teach yourself how subcarriers work!

Project idea: it would be an interesting experiment to add subcarrier modulation to a VHF or UHF amateur FM signal and use it to carry secondary audio or some sort of data stream. I wrote a flowgraph that

does this, too, should you be interested in improving it.

Frequency Modulation

We are all familiar with the basics of frequency modulation from our amateur radio training. FM uses changes in the carrier frequency to encode data, usually in the form of our voice. In FM, the *carrier frequency shifts up and down* in direct correlation to the frequencies and volume of sound in our voice.

This is different from the older amplitude modulation (AM) approach to transmitting information. In AM, *the carrier frequency stays constant*, and the *amplitude* (or strength) of the carrier signal varies to convey data to the receiver.

FM, as we know, is superior to AM in the quality of the information that is transferred, and is less susceptible to naturally-occurring static than is AM. FM broadcast stations have higher fidelity than those on the AM broadcast band.

Radio systems always include tradeoffs, however, and FM pays for this increased signal quality and resistance to interference with an increase in the bandwidth ("wideness" or spread of the signal in the band) required for the signal. Like the law of conservation of energy, you can't get something for nothing, so this increased bandwidth (less efficient use of radio spectrum) is the price we accept for use of a higher-quality radio mode.



FM, as we know, is superior to AM in the quality of the information that is transferred...

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FM signals consume too much bandwidth for our narrow HF bands

You'll recall from your studying days that the bandwidth of a CW signal is narrower than that of an SSB signal, and that all amateur signals must remain within a bandwidth of 6 KHz on the HF bands. An FM signal, such as that generated by our handheld VHF/UHF radios, is even wider. The amateur's legal bandwidth limit for any type of signal on 10 metres is 20 KHz, and it's 30 KHz for the popular 2 metre band¹.

This much wider bandwidth is why FM use on the amateur bands is limited to 10 metres and up. FM signals consume too much bandwidth for our narrow HF bands.

Bandwidth of Broadcast FM

Broadcast FM stations are legally restricted to a maximum carrier deviation bandwidth of 75 KHz², and are centred in 200 KHz "slots" between 88 and 108 MHz. This gives each broadcast station's 150 KHz-wide signal 25 KHz of guard space "left and right" from the adjacent frequency slot so that signals don't interfere with one another.

Broadcast FM has five times as much bandwidth to play with than amateur FM stations or repeaters do. That's a lot of space! Why do they need it?

Extra Bandwidth?

A significant amount of the FM broadcaster's bandwidth is used by the main carrier signal, which (as we know) supports stereo audio broadcasts. Figure 1 is a snapshot of a commercial broadcast station's signal. This is "93.7 JR Country" in Vancouver.

Figure 1 highlights the stereo broadcast portion of the 'JR Country' signal. The bandwidth is marked off in Kilohertz (KHz) on the bottom (x) axis.

Note the large spectra with three components on the left-hand side of the figure. This portion of the station's signal carries its regular programming. This can be in either monaural (single audio channel) or stereo format.

In Figure 1, we can see that the main broadcast signal is stereo by the tall "spike" called a "pilot tone" at 19 KHz offset, between the two leftmost "humps". A monaural broadcast doesn't have the pilot tone. The leftmost hump contains the monaural signal for those (rare) FM receivers that cannot listen in stereo, and the smaller hump to the right of the pilot tone contains information that is used to the split monaural signal into the left and right stereo audio channels³.

¹ Industry Canada publication RBR-4, see <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10650.html#t1>.

² That is, 75 KHz **both** above and below their assigned carrier frequency, for a total signal bandwidth of 75+75 or 150 KHz!

³ This is generally correct, but the details of how the "left" and "right" audio channels are actually encoded to form a stereo signal are clever, and save bandwidth. Maybe this will be the subject of a later column!

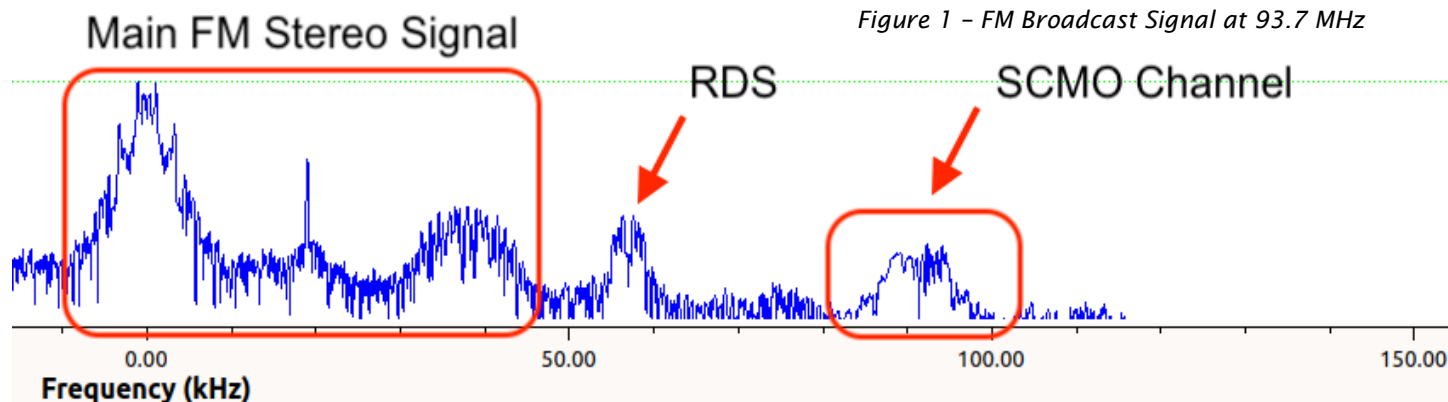


Figure 1 – FM Broadcast Signal at 93.7 MHz

Key in this plot is to look at the total bandwidth of the stereo broadcast (the three signal components grouped together at the left of Figure 1). You should note with some surprise that the stereo broadcast portion of the signal is only about 50 KHz wide!

If the technical specification for FM broadcasting allocates 150 KHz for each station, then why doesn't the stereo broadcast take up all 150 KHz? If the stereo broadcast is only 50 KHz wide, then what is that extra space (up to 150 KHz) used for?

That's the interesting part, and the subject of this column!

Other Features in Figure 1

Your gaze may have been drawn to a couple of the other features in the spectrum of Figure 1. Note the smaller "hump" at around 85 to 100 KHz from the main stereo signal. Note, as well, the narrower couple of signal spikes around 57 KHz.

These are two subcarriers!

What is a Subcarrier?

In the spectrum plot in Figure 1, the narrow subcarrier centered at around 57 KHz is called the RDS ("Radio Data System") channel, and it carries *data* - the textual station and song information you see displayed in your car or on your more expensive home stereo receiver when you tune in the main FM broadcast.

The smaller hump, centered on 92 KHz, is called an SCMO ("Subsidiary Communications Multiplex Operation") channel, and *it carries a complete secondary audio program*, totally unrelated to the main country music programming of JR Country. In the US, the term for this channel is an SCA ("Subsidiary Communications Authorization") channel.

These two subcarriers are bundled up with the main stereo programming, and broadcast on 93.7 MHz as a *single* FM signal.

Neat! How is this accomplished?

SCMO First

Let's deal with the secondary audio programming channel first. There are two designated SCMO channels: one at 67 KHz above the main broadcast signal, and the other at 92 KHz. Think of these channels as "small neighbourhoods on the outskirts of town". Stations that transmit SCMO can technically provide two SCMO channels, but in my experience, I have only ever seen a station broadcast one. JR Country's single SCMO channel is at 92 KHz.

SCMOs are frequency-modulated signals. The same principles apply as with a single broadcast (or amateur) FM modulation process. The SCMO radio station's audio content (we'll cover what the content is shortly) is used to generate an FM signal, but using much narrower bandwidth. It uses narrower bandwidth so that the secondary signal can easily "reside" in the same (bigger) bandwidth envelope (the same town) as the main signal, without either audio program interfering with the other.

If the SCMO station used the same bandwidth standard as the main signal, it too would be 150 KHz wide, and this could not co-exist in a single channel with the main programming. So, SCMO bandwidth limits are set by regulation to only about 20 KHz.

What does this mean from a practical perspective? The sound quality of SCMO channels will not be fantastic, because they are bandwidth-limited. You can only get so much information (quality audio) into a small bandwidth!⁴

However, as hams we know that you can actually do a lot with audio in a bandwidth of 20 KHz - this is close to the 30 KHz amateur bandwidth limit on our 2 metre band. We have pretty good audio on our 2m FM repeaters and in simplex FM communication!

So, the sound quality (as we will see later) of SCMO is pretty good - about the same as we get on a 2m handheld.

⁴ Another interesting topic for a future column! We'll discuss the famous "Shannon's Theorem".

June 2019



Not many radios are able to receive SCMO transmissions.

Local SCMO Content, and My Motivation

As of this writing, only two FM broadcast stations in Vancouver contain SCMO subcarriers. The SCMO channels contain local programming of interest to the large South Asian and Fijian communities in Vancouver. While I don't speak the languages, the musical content is great, and I often leave my homebrew SCMO receiver on in the shack for music while I am working on other projects.

As with many projects, the technology is my interest, rather than the actual use or content of the technology.

I love figuring out how stuff works from scratch, and this project is a prime example of starting with zero knowledge and building up a solution through reading, thinking, and *lots* of trial and error! When I started this project I knew absolutely nothing about subcarriers and how to receive (or generate⁵) them.

SCMO Radio Equipment

Not many radios are able to receive SCMO transmissions. These radios contain extra circuitry to enable them to decode SCMO transmissions. A switch on the radio selects "regular FM" or "SCMO". I have never seen one of these radios physically, but they are cheap and may be purchased on sites like eBay and Amazon for about C\$40.⁶

These radios are likely available for purchase in the Vancouver area as well, but it is far more educational and fun to build your own (or rather, "write your own" in this new world of software-defined radio (SDR))

RDS

The other subcarrier in Figure 1 contains data describing the main audio being broadcast by the FM station. RDS broadcasts are always offset 57 KHz above the main broadcast carrier.

You've probably seen RDS in action in your car (vehicle radios all seem to include RDS demodulation these days): it'll say something like "JR Country 93.7 - All your favourites!" and info on the current song, or what song is coming up next.

The RDS standard is a bit odd. Data for RDS is transmitted using biphase encoding of unencrypted ASCII bytes at a data rate of 1187.5 bits per second. The transmission includes some basic error correction. There are technical reasons for the weird data rate, but suffice it to say that 1187.5 bps fits nicely with other FM broadcast technical specifications.

If you want to demodulate RDS yourself, then this is well within the capabilities of the open source gnuradio package. You can use a pretty simple gnuradio flowgraph to filter out the RDS data stream and recover the bits from the full broadcast signal. The data bits can be packed into bytes, and then you send the byte stream to a separate program which recovers the song and station information. In Part 2 we'll talk about how this is done in a bit more detail, and I'll point you to a working flowgraph I wrote.

Putting Three Signals Together

Okay, so we have the main audio program (wideband stereo audio), an SCMO narrow bandwidth FM signal, and an RDS data stream. How do we get all three of these signals "onto" a single FM carrier for broadcast?

Once again, our basic amateur radio knowledge comes to the rescue!

The answer is that the three signals are mixed (or added) electronically, to produce a single overall "baseband" signal that is 150 KHz wide. This signal will contain:

⁵ In a future article I may describe my broadcast FM and SCMO *transmitter*. I was able to generate a standard FM broadcast signal with an accompanying SCMO subcarrier using gnuradio! Obviously, this was not used for actual broadcasting, just tested in the shack!

⁶ See, for example, https://www.amazon.com/s?k=sca+radio&ref=nb_sb_noss_1

1. A stereo audio component - the main broadcast content ("JR Country");
2. A low speed data stream containing the RDS information; and
3. A secondary audio program (the SCMO channel) that has already been FM modulated.

The RDS signal is shifted up in frequency to be based at 57 KHz. The SCMO information is shifted up by either 67 or 92 KHz. These two "subcarrier" signals are then added to the main audio to produce a 150 KHz wide "baseband" signal.

Note that this combined baseband signal cannot yet be transmitted on the FM broadcast band, as it's only "at" 150 KHz! Before it can be broadcast, the baseband signal has to be further mixed (up-shifted) to the station's assigned broadcast frequency.

The baseband signal is used to FM modulate a carrier (in this case) at 93.7 MHz, and this signal is broadcast to listeners. All three "channels" (main signal plus two subcarriers) have been combined and broadcast as a single FM signal!

To Be Continued...

Next issue we will discuss decoding of SCMO and RDS signals. We'll examine how this FM radio signal with two embedded subcarriers can be received, the SCMO and RDS channels recovered, and then decoded in your shack.

We'll look only briefly at how the main stereo FM broadcast is recovered, because that is not the main topic of these articles. We can listen to main-channel broadcast FM anytime, after all!

We will look in some detail at the SCMO channel and explain the steps necessary to "rescue it" from the broad 150 KHz signal at 93.7 MHz, and also talk about how to demodulate it so that we can listen to the embedded audio programming. I have a working SCMO recovery flowgraph that I'll provide, so that you can try it yourself!

We will also look at how the RDS signal can be recovered and decoded. I have a flowgraph for this too, and will be able to provide you with my RDS decoding program.

That's it for this month! Feedback can be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Best of luck on Field Day for those participating, have a great summer, and 73,

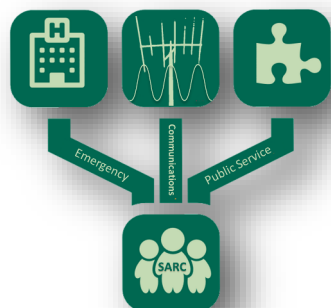
~ Kevin VE7ZD / K7MCQ



Many amateurs already know that "73" is from what is known as the "Phillips Code", a series of numeric messages conceived for the purpose of cutting down transmission time on the old land telegraph systems when sending text that is basically the same.

In the April 1935 issue of QST on page 60 there is a short article on the origin of 73. This article was a summation of another article that appeared in the "December Bulletin from the Navy Department Office of the Chief of Naval Operations". That would be December of 1934.

The quotation from the Navy is as follows: "It appears from a research of telegraph histories that in 1859 the telegraph people held a convention, and one of its features was a discussion as to the saving of 'line time'. A committee was appointed to devise a code to reduce standard expressions to symbols or figures. This committee worked out a figure code, from figure 1 to 92. Most of these figure symbols became obsolescent, but a few remain to this date, such as 4, which means 'Where shall I go ahead?'. Figure 9 means 'wire', the wire chief being on the wire and that everyone should close their keys. Symbol 13 means 'I don't understand'; 22 is 'love and a kiss'; 30 means 'good night' or 'the end'. The symbol most often used now is 73, which means 'my compliments' and 92 is for the word 'deliver.' The other figures in between the forgoing have fallen into almost complete disuse.



Public Service

Amateur Radio Serving The City Of Surrey

Public Service Principles

Public Service Report

Don Hamilton VA7GL



What is value of Field Day to Amateur Radio Public Service?

Is it just basically a large picnic held by several thousand stations around the world? Is it to demonstrate our

commitment to Public Service and emergency preparedness? Let face it, most of our fellow citizens of Surrey don't understand what an Amateur Radio Operator (ARO) is or does. Mostly we are seen as an annoying eyesore with large "metal trees" in our backyards and funny antennas on our cars. Sometimes also a disturbing voice out their cheap stereo speaker. The question the public is asking; "What use is an ARO in a digital age" we have full cell and WIFI coverage at our fingertips, it is a mystery.

One of the strategies is for us ARO's to participate in a field day event. This can serve as an interface with the public, City of Surrey and Surrey Fire, to show the practical application of some of the talent we bring to the public service table. We can physically demonstrate our commitment and understanding of complexities of emergency communications and operations, plus the depth of the equipment knowledge, all together in a fun contest, complete with a picnic.

For us ARO's, it is also a get-together with an opportunity to polish communications delivery skills by learning to work together to deploy a vast amount of complex equipment that will communicate to the world in short order. We will be off the grid, and we will be able to answer any question from the host of invited

visitors. Isn't this the vital components of what we are expected to accomplish in the event of a Public Service/emergency callout?

The concept is, by working planned incidents, it becomes the training ground for unplanned disasters, without the pressure of an incident. Therefore, the basic activities for field day and the emergency call out for us AROs is the same as we will be practicing our communication skill during Field Day.

During these "unplanned incidents" like hurricanes, earthquakes, forest fires, snow storms, and other natural or manmade disasters, we expect SARC public service group to be able to deliver the same planning, implementation and execution as we are going to show during field day.

The biggest concern, along the Pacific coast is a major earth quake. With the potential to disrupt life for a hundred miles inland, this is sobering stuff. By practicing deployment, we can become skilled setting up and activating our stations. This is how we can best prepare to assist the professionals during the next catastrophic event.

Hopefully you will now be motivated to participate in field day. This should help you to find out how you can be the most effective in assisting your fellow residents of Surrey. Plus, you might even learn a few need strategies to work rare DX in a down sun spot cycle.

~ Don VA7GL





SEPAR Report

Gord Kirk VA7GK



This last month SEPAR participated in a Mutual Aid Scenario (MAS) communications exercise run by VECTOR (Vancouver Emergency Community Telecommunications Organization) as an adjunct to Vancouver City's "VANSLAM" earthquake exercise. Along with other emergency communications organizations from the North Shore, Coquitlam, Mid Island, and the Provincial government radio rooms at the PREOC's (Provincial Regional Emergency Operations Centres).

VECTOR saw an opportunity to expand the emergency communications aspect of VANSLAM in order to give a number of local authority emergency communications teams an opportunity to work together on exercise day. There is not enough of these opportunities and VECTOR hopes that this Mutual Aid Scenario will be a springboard the local Amateur Emergency Communications groups to work together to develop joint drills and exercises in the future, leading up to the provincial earthquake exercise happening in a couple of years.

The VECTOR MAS objectives included things we routinely do - but also included some oddball aspects which might seem artificial but allowed us to have out of the box opportunities to test our systems and capabilities.

The VECTOR Objectives were:

- Establish voice and data communications using all modes and means (commercial and amateur) between participating local authority emergency communication teams and the regional coordination centre, the SWE PREOC
- Coordinate and establish inter-municipal communications as required for mutual aid and other purposes
- Attempt to establish emergency communications between SWE region local authorities and an alternate regional coordination centre (CTL PREOC, Kamloops)
- Provide additional load on the Vancouver EOC Communications Unit, systems and frequencies used regionally
- Evaluate the performance of teams, systems and modes
- Share what has been learned
- Use the results of this mini-exercise to collaboratively design a next exercise

The injects and requirements will ensure that tactical and structured message traffic is passed on commercial and amateur radio voice and data VHF/UHF and HF systems.

SEPAR decide to run this exercise from our OTC (Operations Training Centre) to learn what we could from operating from this location. The exercise was based on an earthquake, hitting Vancouver and at one point impacting all telecommunications. VHF, HF and Digital modes were tested. Messages were asked to be passed, and communications pathways via various modes were tested between the participating communications groups.

Jason VA7ITJ, Rob VE7CZV, Richard VE7IMH and myself (Gord VA7GK) participated for the morning. We had some limitations at the OTC we may not have had from our normal radio room located at Surrey Fire Hall 1. Part of our planning was to identify what we would need to allow multiple operators work from this location using the modes and bands asked of us during the exercise.

We did have some good outcomes which will lead to us planning our next steps in developing the operational capacity of the OTC.

Two major areas we will focus on as a result of this exercise are 1. Improving our documentation, including frequency lists etc. and 2. improving the physical set up for operating from the OTC.

A big thanks to those who participated from SEPAR. There is nothing better than actually exercising and proving what does and doesn't work. We hope this is one of many future exercises where we test our plans and assumptions, and improve on the areas which did not go as planned. As we discuss what did and did not work with the other participants we hope we can take their lessons learned as well and develop some common best practice items to help all of us be better prepared to provide communications should we be required to do so.

~ Gord VA7GK
SEPAR Coordinator

June 2019

The Contest Contender

John Brodie VA7XB

WPX WW CW Contest



The WPX CW contest is one of my favourites because without a doubt, CW is the most challenging mode of all and it brings out thousands of DX stations around the world that you normally would not hear. This one was especially interesting because only 3 SARC operators were available - Jan VA7VJ, Slawa VE7LWW and John VA7XB, and we had 48 hours to fill.

We are featuring Slawa in this report because he made the lion's share of the contacts, over a mind-numbing 16 hours of operating time and we look to him as our inspiration for greater contest achievements.

Conditions were surprisingly good on Saturday, with EU open into the afternoon and evening hours. Contacts were made on 10 m through 80 m but 20m and 40 m were the most productive.

On Saturday afternoon Slawa noticed an SSB spot from his old colleagues ER1DX and ER1MM from Moldova, and took some time away from the contest to chat with them. Then later he confirmed a CW contact with G3TXF, who Slawa informed me was a fellow DXpeditioner from England. Slawa appears on his website.

Claimed score in this contest was 955 contacts for 1,275,300 points, probably a record for us.

From the website of G3TXF: Slawa at his former QTH in Moldova - note the beam and vertical antennas on the roof of his apartment.

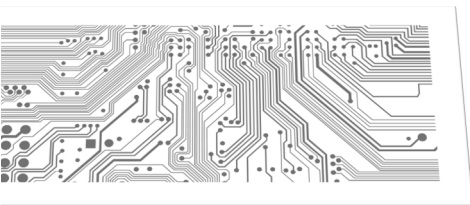
Slawa VE7LWW showing future CW operators how it is done.

By Sunday morning conditions had changed and it was tough slogging for contacts anywhere. We packed it in around 1 pm as nearly all the stations we heard had been worked, no-one was responding to our CQs and DX was virtually absent. As an aside, John VE7TI working from his home station reports that he made 6 contacts by the "Fishwick method" [see this month's QRT column] using a CW decoder.

Every contest has its revealing moments and this one was no different: in an earlier contest Jan had noticed that the TH7 beam on 15 m was showing high swr when 1 kw was put into it, but not at 500 w. During the current contest, the problem reappeared, but at all power levels, so we definitely have an antenna issue to resolve over the summer. The beam will have to come down for a detailed inspection. Perhaps we have bugs in the traps or a balun failure is also possible, but it is significant that the high swr does not drift as it would with a heating issue.

~ John VA7XB





TECH TOPICS

Daniel Romila VE7LCG

Breadboarding for Electronics (as a good mental exercise)

Many hobbyists do not need the electronics projects they make. They do one single build from each schematic. They do their best to put it in operation, to tune it, and after they leave it in a drawer, never to be used. Eventually, they write an article about, as I do. There is nothing wrong in this. Putting things together (electronics in the case of this article) is a very good mental exercise and it is fun. Writing an article about the just completed electronics project/schematic is a summarizing and mental focus activity, a kind of glorious ending.

The eventual problem can be the space to put the final products.

In the last years I amassed some tens of thousands of transistors, quartz crystals, filters, integrated circuits, resistors, capacitors and so on. You can add to this several kilos of solder, wire and hundreds of prototyping PCBs. This is because browsing Chinese websites is so much fun. And I always find a hundred transistors of whatever type for C\$1.- 2.00, shipping and taxes included, so I buy them. Do I need them? One can never know. I hope you do not want me to confess that I am a hoarder. When I finally get the components from China I try to remember what I wanted to do with them. Usually there is nothing to remember. But I always find something to do with those components.

After organizing them, I found that I already have components for at least 10 years to come, 10 years of intense work.

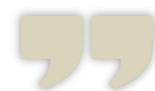
And still I continue to buy more. Fifty cents for some screws, a couple of dollars for some Schottky diode rings with their ferrite tors, encapsulated. You get the idea.

For me, browsing for electronics is second only to browsing online for watches. I can look at watches many hours a day. I do not wear a watch and I have absolutely no intention to ever buy one.

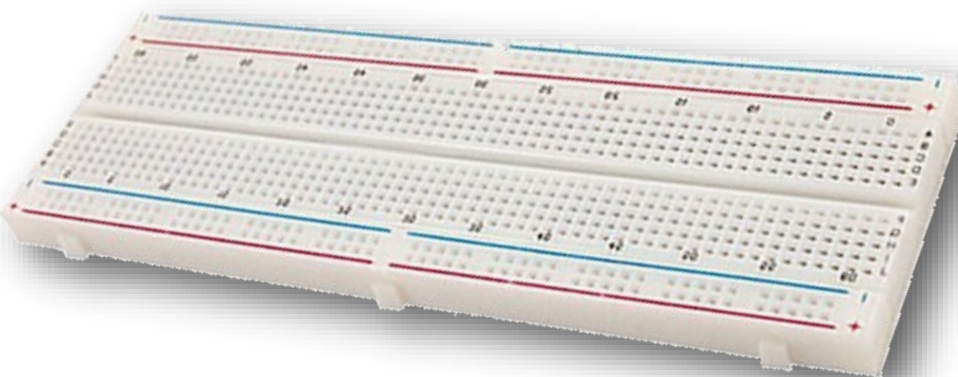
There are two solutions not to crowd the space with the final electronics I make:

- Prototyping on breadboards and re-using the components
- Simulating the electronic schematics on the computer, with no practical aspect involved.

I usually combine the two activities, but lately I am more inclined towards the second activity, but this article is about breadboarding. For less than C\$3, shipping and taxes included, one can buy an 830 point breadboard in April 2019, and it is cheaper to buy a bunch of them at once.



***For less than C\$3,
shipping and taxes
included...***



June 2019

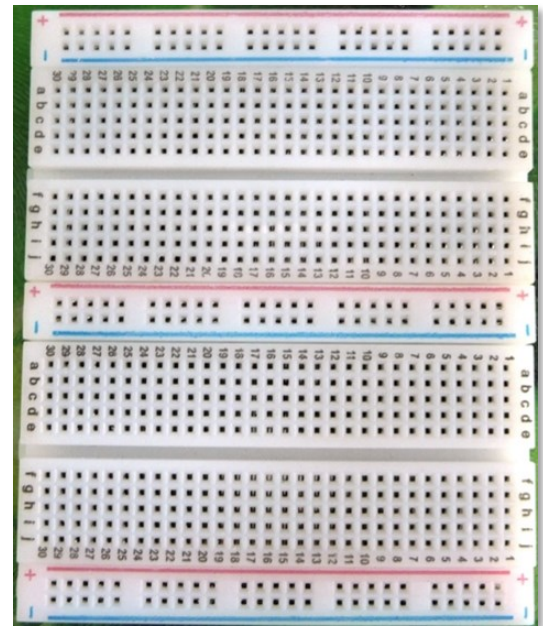
The upper and lower parts of the breadboard are used for the power supply lines. The upper and lower parts have no connection between them, so if you want to use both of them at the same voltage you use some connecting wires. I also found newer breadboards which intentionally have a gap in the middle of the red and blue line of points/holes, so it is a good idea to verify the continuity. Integrated circuits can be placed in the middle of the breadboard. There are electrically connected points/holes, 5 of them in a vertical group. A good place for seeing the electrical detailed schematic of breadboards and very beginner instructions is:

<https://electronicsclub.info/breadboard.htm>

I bought and use several breadboards. I found it useful to use a separate breadboard as an electric building block, like for example the VFO on one board and the audio on another board. While I successfully made an FM radio on the breadboard, it is not a good idea to work at higher radio frequencies on them, and I never work at more than 24 V. The capacitance I measured between two adjacent groups of 5 points/holes is 6 pF. The breadboard itself can sustain 50 - 100 Volts without a problem, but I cannot. The breadboard is pretty much an exposed circuit with cables that can detach and touch the user, so I really prefer to work with them at less than 24 Volts.

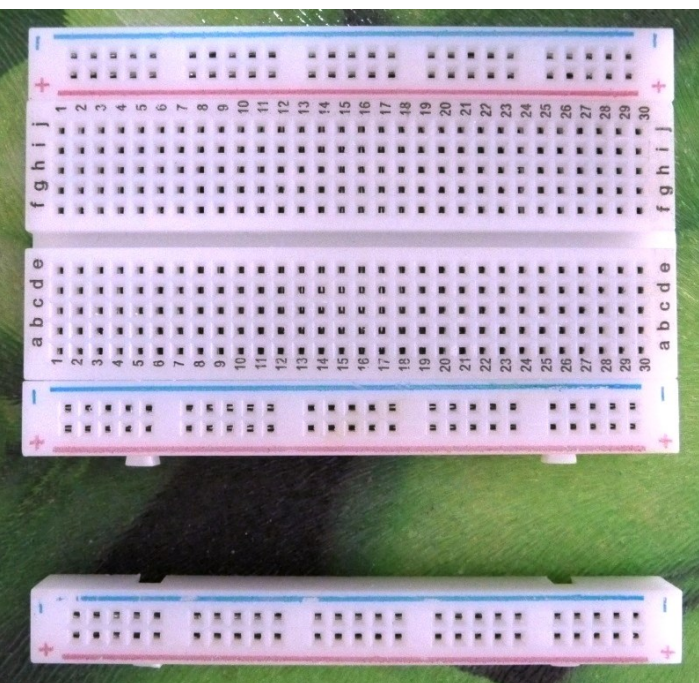
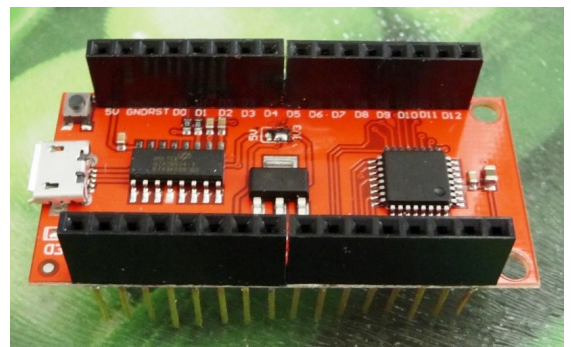
In addition to the 830 point unit mentioned above, I also use breadboards with 400 points, which in April 2019 are C\$1.36 each, shipping and taxes included. They are substantially cheaper per piece if you're buying 3 or 5 of them at once.

Those 400 point breadboards have detachable strips for the power supply lines. This allows them to be combined by assembling them in many different ways, like for example:

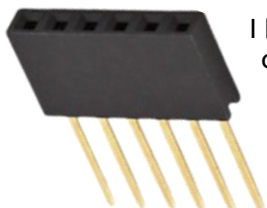


The above picture shows an assembly in which I created 4 different connection zones, plus 3 power supply zones. When working with microcontrollers and microcontroller development boards, which are larger than one single integrated circuit, I found it particularly useful to place them in the middle channel, intended for that purpose. There are other smaller breadboards that I never found useful.

Breadboarding can be very much simplified by using modules with connectors. For example, I always keep a WeMOS microcontroller development board I soldered like this:



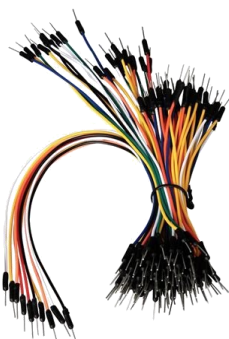
There are long pins below that can enter into a breadboard. But the upper part can also be connected with jumper wires.



I bought 100 such connectors for C\$9.03, shipping and taxes included, in March 2019.

When breadboarding, one also needs wires, as in the following picture (male to male, female to female, and combined ones).

They are very cheap. The most efficient way is to buy a strap (40 - 50 wires put together, sold under the name of Dupont wire jumpers), and take them apart, one by one. There are various kits containing a bunch of bread-boards and wires of various lengths. Depending on your needs it can be cheaper to buy a whole kit.



Other useful components are breakable pin headers [left]. The longer part can be pushed into the breadboard, using the upper side for measurements.

Since I play a lot with breadboarding I found it useful to build modules that I consistently use, like an audio 800 Hz generator with 555 integrated circuit, and an amplifier with an LM386, a headphone jack and volume adjustment. (In the meantime, I have completely abandoned using the LM386 for new projects, but that is an old module, that I still use) [top right].

For C\$0.50-0.92 (shipping and taxes included) in April 2019, you can buy a dedicated power supply module for a breadboard [middle right]. It has on it 5 V and 3.3 V stabilizers and switches. They match the size of the breadboard and are conveniently equipped with power connector, USB connector and LED indicator.

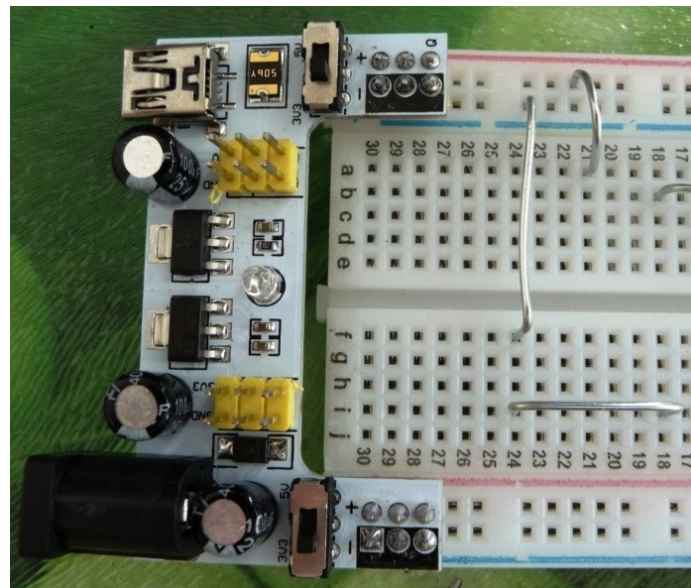
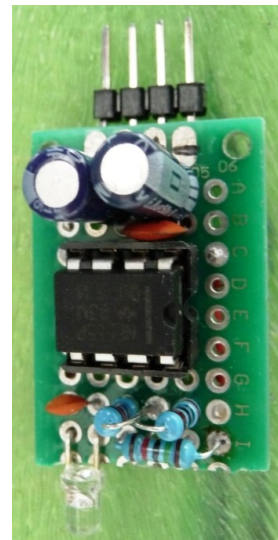
I use LEDs for indicating the power supply status on every single module I make. In the picture you can also see short jumper wires that I make myself by cutting them from a 72 meter, 20 gauge roll that I bought for C\$1.50 plus taxes from Dollarama [lower right].

At April 2019 prices, one can buy a bunch of breadboards, jumper wires, a frequency meter, digital voltmeter, LCR transistor meters, and a thousand electronic components for less than C\$200.

Together with a book like "73 schematics for radio amateurs" by A. Sahleanu and N. Rosici, or "330 montajes de electronica" [in Spanish] by Henry and/or similar books, one can have fun to experiment and play and not have enough time in a 24-hour day.

It is a good mental exercise which can become very intense, too intense. It helps to have a good attention span and focus, but it is also good for memory. Because I must continuously follow electronics schematics and implement them on the breadboard, I can remember an incredible number of schematics, drawings and values by heart. I found it useful to set a time limit for myself when breadboarding. When I start I decide a time when I will finish, no matter what. Even if it is just to power it up to see the project working, if the time is up... I stop.

~ Daniel VE7LGG



June 2019

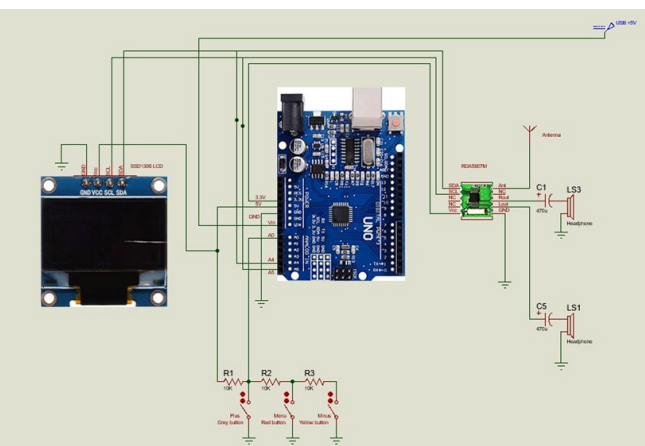
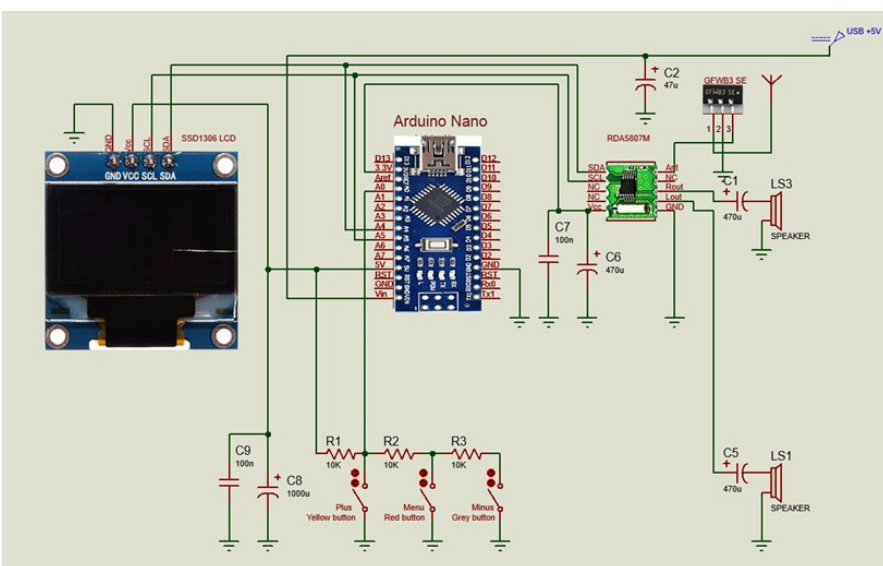
SOLDER SPLATTER

Daniel Romila VE7LCG

FM Stereo Radio With Arduino [Part 2]

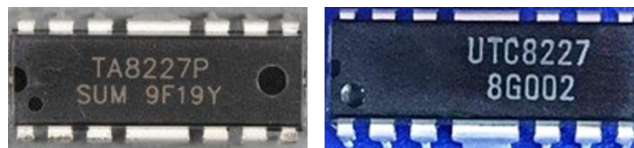
In the April 2019 Communicator we presented Part 1 of this project. This month, Part 2.

The working schematics is:



other radio modules, with other integrated circuits, which do not contain any audio parts

inside them and indeed need external audio. While it worked with LM386 (two of them) and with TA8227P (stereo amplifier), also known under the name UTC8227, the best was without either of them for this particular RDA5807M module.

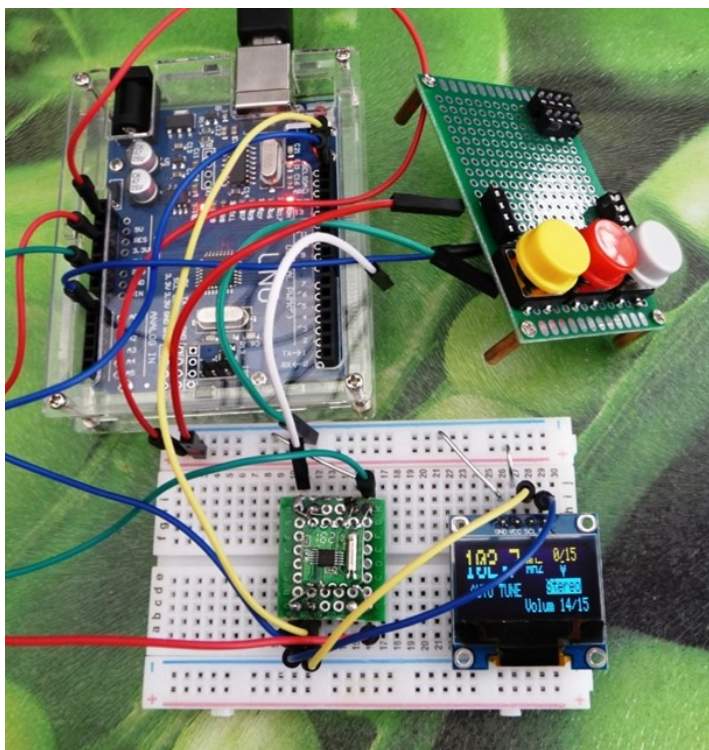


Since the level of sound was strong, I asked myself why I would use those amplifiers that draw power from a 5 V power source, eventually a USB port. I found out that separating the output of RDA5807M with 470 microF capacitors was enough to connect to headphones (Sony MDR-V700), and not the radio module. This was expected and I should have tried it first. I did not do it because I had the strong belief that while it would work, the audio power would not be enough, anyhow. But RDA5807M provides so much audio power that I could not keep the headphones on my ears. So not only does it have enough power, it even has enough reserve for any headphones, however deaf they might be, the volume will always have to be turned down from maximum.

Since my prototyping board is so small (yes, I chose to make the radio on two very small 4 by 6 centimeter boards), I would not be able to make many modifications on board once all components are soldered. So I first verified the 3 switches for the menu, plus and minus. I did this verification with my trusted Arduino Uno board, which is in a plastic capsule and is thereby protected against wires coming on top and shorting it. Soldering is the way to go, when you are sure the schematics works. I was not sure yet, so I verified the design first.

It is also possible to do it as a shield for Arduino UNO (= a board inserted in the connectors of an Arduino Uno board, on top of it).

I considered the idea of using an audio amplifier. I was under the influence of



The OLED display that you see here is a yellow/blue one, not the intended blue only model. I am still waiting for it to come from China, and I hope that when I finish writing the article that is what I will eventually solder on the prototyping board. I verified it goes through all 4 menu screens AUTO TUNE, MANUAL TUNE and VOLUME . Everything looked OK.

But it worked slowly and I even measured the switches to see they make good contacts. They are new, and they were OK. The cause was that the sketch (the program) was developed successively by various hobbyists and it became longer and longer. It even called libraries which were never used, and it made everything slow. So, I modified the sketch and now it is fast and responsive. I push a button and instantly it does what it is supposed to do. My sketch can be found at:

<https://github.com/danielromila/CW-keyer-with-TTGO-Xi-version/blob/master/Radio%20with%20RDA5807M.ino>

If it is the first time you use your OLED display and/or you use several other displays, you will eventually need to edit the ADAFRUT SSD1306 library, to reflect that you intend to use it in a 128 by 64 dots configuration, not other resolution. If you build the schematics and the display is garbled, you will need to do this as described at:

https://github.com/danielromila/CW-keyer-with-TTGO-Xi-version/blob/master/Radio%20with%20RDA5807%20editing%20Adafruit_SSD1306.txt

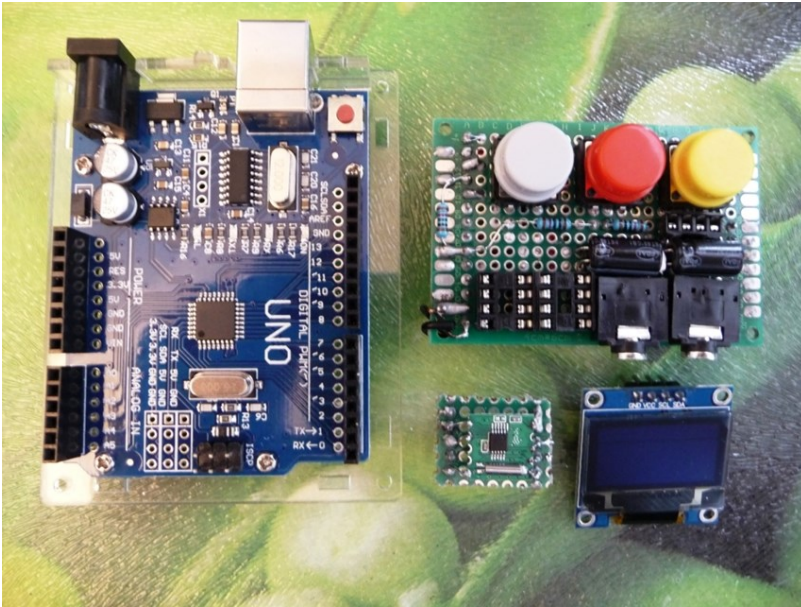
Since my components from China were slow to come, and it could take several months to receive them, I decided to use a shield for the Arduino Uno for this article, in order to show it to you in operation, and to have some conclusions that can immediately be used by others who eventually want to replicate what I did. My shield in operation looks like this.



Once I put on a longer antenna, the radio started to display the digital information the station sends, in the left lower line of the display. I made the shield with sockets, in order to verify the modules when they finally come from China, especially the OLED displays, which are meant to be monochrome, not yellow blue as I have and use now.

The radio is useful and enjoyable to use. Both auto-tune and the manual tuning work. I do not see why somebody would change the station from RED to another one, and stop listening to Punjab Rock, but the radio works through the entire Canadian FM band.

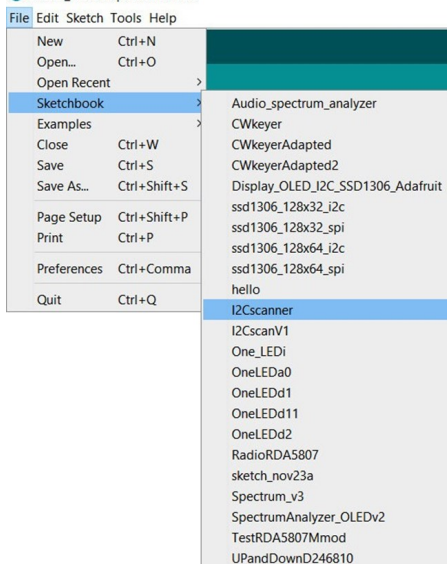
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It is easier to modify the software and load it again and again in a compact radio construction as I did, a shield on top of ARDUINO UNO, or - even better - a dedicated ARDUINO NANO board soldered with all the other modules in a dedicated forever radio. It is difficult to work with a breadboard project and to try to keep all wires in place while changing the antenna, the USB cable and the headphones.

Some playing around and conclusions:

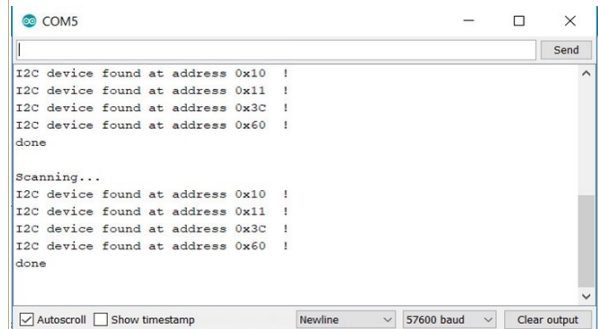
sketch_mar01a | Arduino 1.8.8



I2C communication

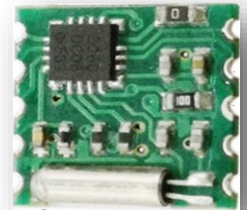
You can see in the schematics that the display module is in parallel with the radio module. The microcontroller knows to work with them because each one has a separate address. The address of the modules can be found by loading a sketch into our Arduino Nano built in an Arduino IDE package (we can still load various sketches into the Arduino Nano board, even if it is used in a radio configuration).

Opening the serial monitor we will see:



It looks like we have four I2C modules, instead of two. Actually, the RDA5807M declares 3 addresses. If the main program uses the 0x10 or the 0x11 address, the radio module is used as a true RDA5807M. One of those 2 addresses is a slave address that can call some registry data. Something like this is not mentioned in the short version of the datasheet, which is just 23 pages. If the third address is used, 0x60, the module is dummied down and functions as a TEA5767.

After long searches I found a radio module that knows the FM and AM (the MW band, but it requires the user to add external components to the module, especially a ferrite rod). It is based on the integrated circuit SI4730 and it cost C\$4.03 in March 2019, shipping and taxes included.



A Korean started to write an Arduino library for SI4730, in October 2018.

<https://kuznets.iptime.org/?p=327>

Maybe there are other people already using SI4730 with Arduino. The 42 page public datasheet is a good start for writing an Arduino library, but this is way above me and above what I want to do, anyhow.

All those radio in a chip integrated circuits were not meant to work with Arduino boards

They can work with Arduino boards, but they are mostly used with dedicated ASIC (application specific integrated circuits) which are much faster than a microcontroller running software. A microcontroller ATMEGA328P is at the limit of being usable

when more sophisticated display modules are used - eventually coloured and touch sensitive. It also requires 2-3 seconds for booting. You won't see that in an ASIC design radio. The Arduino libraries written for such radio modules know to select several FM bands and it is possible to change from the 87 MHz - 108 MHz band into the 76 MHz - 108 MHz band. Using the extreme capabilities of the radio integrated circuit was not intended with those libraries, so do not expect to make a 50 MHz radio with Arduino just because the hardware in the integrated circuit RDA5807M knows to receive 50 MHz. At least it would not be easy, not as easy as to replicate the work already done by someone else.

Programming through the Arduino platform

The platform generally offers slower programs in comparison with direct programming of the microcontrollers of those boards. The point of the Arduino general environment is to use it as an education and experimental tool. One can make a sketch, load it and verify it. And do it again and again, with small verifications, a thousand times. I loaded and loaded modified versions of the radio sketch myself more than 30 times.

The Arduino platform makes the use of microcontrollers easy

The program stays the same - the program will function even in a board with a very different microcontroller than the Nano, for example one with ARM processor, Arduino STM32. Arduino IDE adapts the program for a specific board when it compiles the program and when it uploads the program without the need of user intervention. The user just programs without knowing all the intimate details of the microcontroller. If the program asks too much from the given connected board/microcontroller, it will say so.

Arduino UNO and Nano are slow boards

They work at 16 MHz which can be enough for minimalistic functions, especially those without graphic displays. In the future I will use faster boards, like TTGO XI 8F328P-U. They are not Arduino. They contain a much more capable processor, but incorporate ATMEGA328 commands and can be used instead of an Arduino Nano board. They work at 32 MHz instead of 16 MHz.

I reviewed this board and presented a CW Keyer made with this board in the January 2019 issue of The Communicator, page 36. I also ordered STM32 boards which look like Arduino Nano, can be programmed with Arduino IDE but are based on a different architecture processor (ARM) and work at 75 MHz instead of 16 MHz. All those families of boards are under C\$ 3.00, shipping and taxes included, in March 2019.

Some words of caution

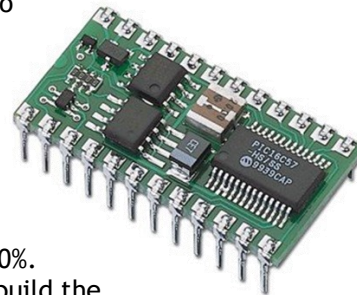
I do not invest much effort into learning Arduino. Not only because it is an old platform already, but such platforms existed before. They appeared, disappeared, and new ones took their place. No one remembers Basic Stamps anymore, made for PIC micro-controllers.

My instant success rate with Arduino projects is under 10%. That means that I build the hardware for what I want and look for other people who did something similar and posted on the Internet. I try to start as close to what I want myself and use something already done by others as much as possible. I load a sketch, and if it does not work, I look for another article, the work of somebody else, and so on. It takes me some 10 iterations before finally making it work based on replicating somebody's else efforts. I have problems in replicating my own work after several months, because some ready made software modules changed their version and do not match with the rest.

I try to make my articles simple and informative. I intentionally avoid crashing the reader with too much information at once and I first present what it is easier, nicer, and can bring some degree of instant gratification. But now is the time to write that any Arduino project requires:

- Installing on the computer a programming software for the Arduino boards, something like Arduino IDE. This software is available free from:

<https://www.arduino.cc/en/Main/Software>



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...documentation of such integrated circuits is a book with hundreds of pages, and not easy reading.

As of March 7th 2019 the version is 1.8.8. This might be compatible or not with the “sketches” (= programs written in C and C++ like language) that you find on the Internet and eventually you want to use in your projects. Often those sketches require small adjustments.

- The sketches are not complete programs; they call “libraries” (programs that are made usually by manufacturers) and that are used and re-used in various projects for using displays, buttons and so on. As you imagine, those “libraries” have their own version, which might work or not with the version of the Arduino IDE, the version of the bootloader, the version of your board (no, if one board looks identical with another one you cannot be 100% sure they are the same!) and with the version... of other called libraries. In order for a sketch

to use those libraries they have to be imported and I already mentioned in part 1 of this article about an online explanation of this process.

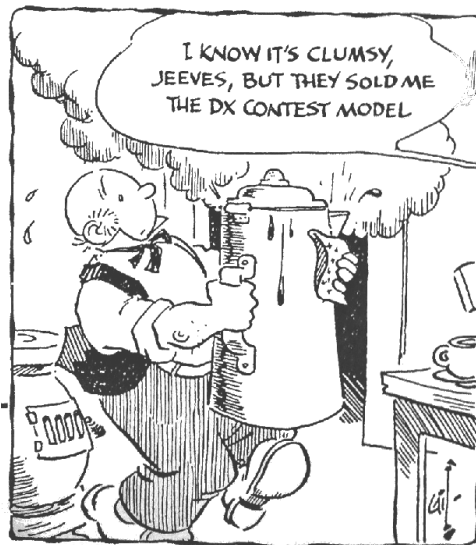
Another good tutorial is at:

<https://www.baldengineer.com/installing-arduino-library-from-github.html>

It's awesome that somebody else made libraries. For example, the RDA5807M radio module that I used has a modest public 23 page datasheet, which can be a start for making a workable library. The true documentation of such integrated circuits is a book with hundreds of pages, and not easy reading.

But the Arduino platform, and also the Raspberry platform, are fun.

~ 73, Daniel VE7LCG

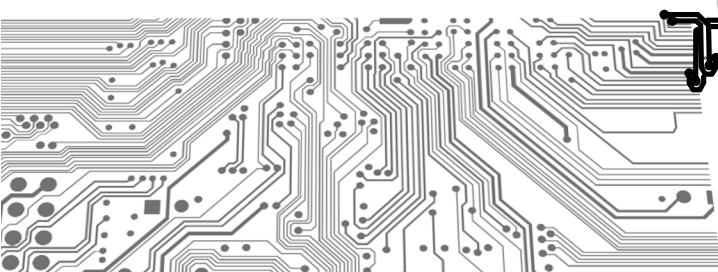


Courtesy ARRL
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Social Reminder

The Surrey weekly social gathering is on Saturday at the Kalmar Restaurant at 80th and King George Boulevard between 8 and 10:00 am. You don't have to be a SARC member to participate. Bring your significant other, bring your family, see old friends and have fun.



TECH TOPICS

Daniel Romila VE7LCG

Verifying Electronics Schematics with Computer Simulation

It is a good idea to use a CAD (computer assisted design) program whenever one draws a ham radio schematic. It is easier to share with others and it is easier to understand what represents. It is also useful for the hobbyist because the CAD imposes rules, like not permitting component placement without values. After some months you can forget such details and hunt back to reverse engineer your own work.

But I also find it useful to draw the schematics in a CAD that is also capable of circuit simulation when trying to copy and eventually improve the work of others. Many schematics found on the Internet either contain small mistakes that would make my practical implementation not to work, or simply because they worked with the components the author had, but not with mine.

In my opinion, the most useful programs for drawing and simulation are:

- **Proteus**, which at April 2019 release at version 8.8 SP1. I believe it is the most user-friendly program in its category. It is easy to add on schematic measurement instruments, including frequency generators and oscilloscopes on the same page with the schematics, without the need of continuously changing from one screen into another, like the majority of other programs require. Unfortunately, Proteus needs a powerful computer. The simulation crashes from time to time, and it has severe problems with simulating oscillators. It is possible to use the computer speaker itself for audio from the drawn schematics. That means that one can draw the electronics schematics of an

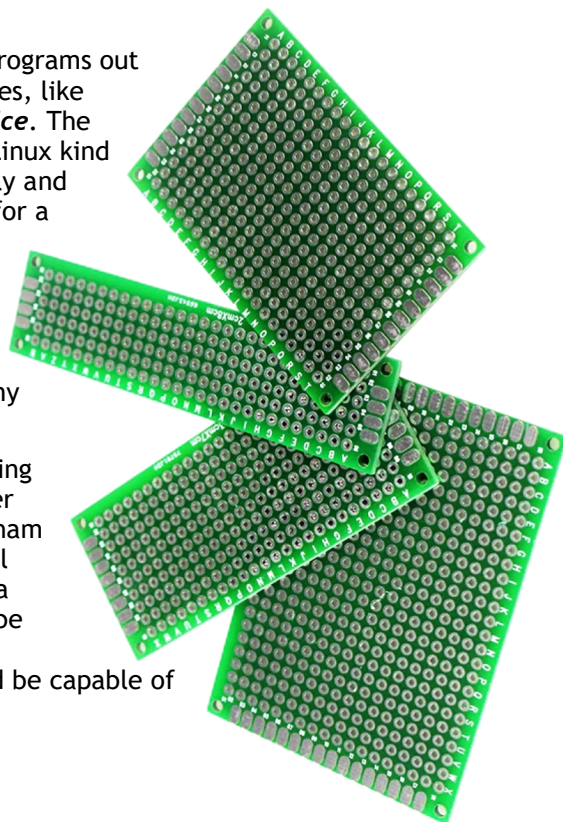
electronic bird and even test, adjust and hear the sound of the final prototype without soldering a single wire.

- **Multisim**, which in April 2019 is at the version 14.1. The academic version even allows for a virtual breadboard to be used. It has good and easy simulation for radio frequency circuits too, including oscillators. It is easy to make and add simulation SPICE models for new electronic components.

The above two computer programs are well established and have plenty of components into their library. They can also generate a PCB board, feature which is less useful for me because I prefer to use perforated double-sided prototyping PCB boards.

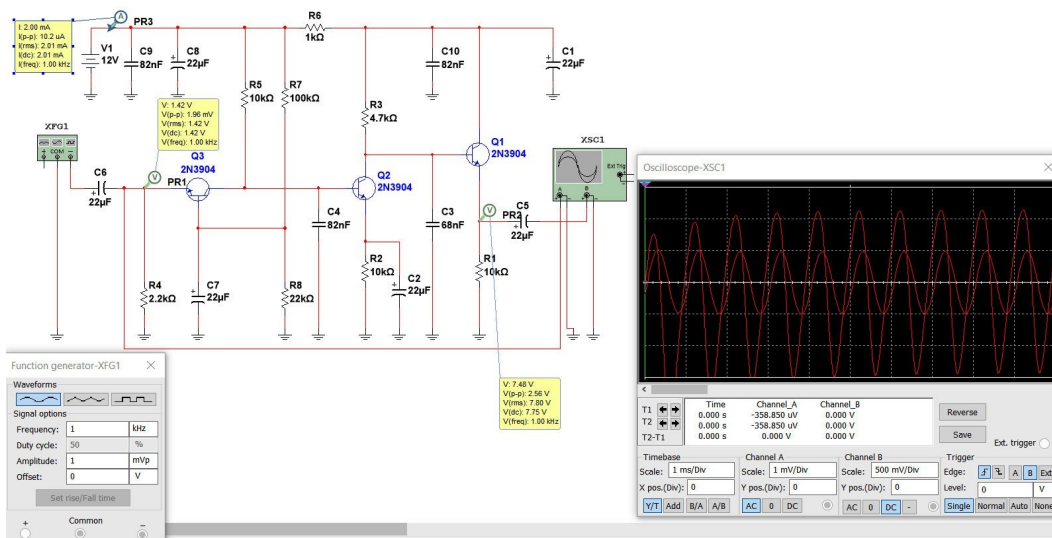
There are many other programs out there, including free ones, like **KiCad**, **Tina** and **LT Spice**. The free ones have a more Linux kind of look, less user friendly and less polished. I believe for a researcher/prototyper Proteus and Multisim are the most useful ones. Multisim can even run in demo mode online, without any installation.

For example, I was looking for an audio preamplifier for a direct conversion ham radio receiver. The total audio amplification for a direct conversion must be around 100,000, so the preamplifier part should be capable of



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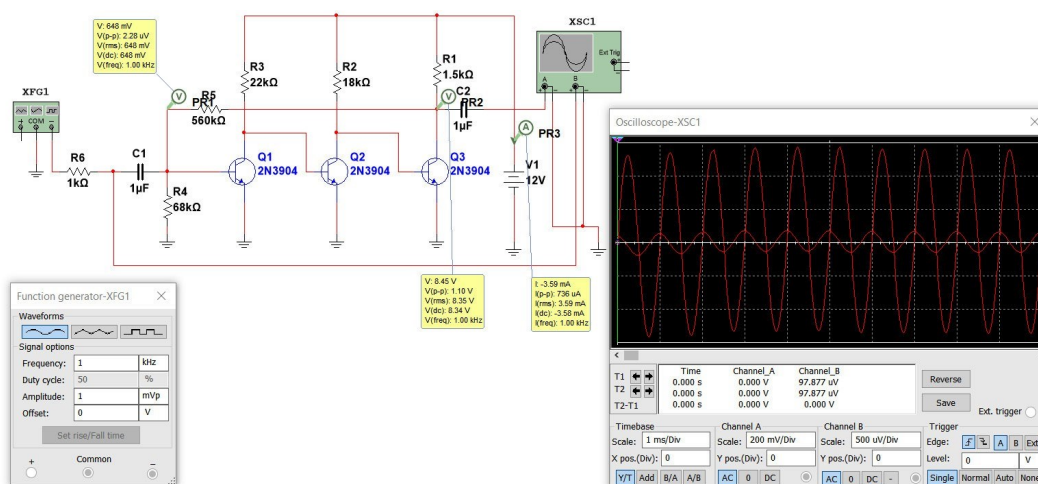
at least 1,000 times amplification. There is a high danger of self-oscillating. Looking for such schematics of an audio preamplifier I found several on the Internet and I drew them in Multisim, shown below.



Because I “brought” the schematics into a computer simulation program, I could add a dual channel oscilloscope, useful for following the IN and OUT signal. With 1 mV (peak to peak) input at 1 KHz, the output signal is still not distorted. The program also allowed me to attach virtual voltmeters and ammeters. In this way I know the practical preamplifier, if I actually build it, will consume around 2 mA at 12 V power supply. The input impedance is low (under 2.2 KOhm, the value of R4)

and pretty stable, as capacitors C3 and C4 limit the amplification at higher frequencies and kill the self -oscillation tendency of such circuits. The signal generator connected on the left, as input, can be adjusted in frequency and voltage, and I can see what happens for various values. The program can automatically perform many more analysis, but I keep it simple for this article.

So, the above schematic has a chance to work and is worth trying.



Another schematic that I saw on a lot of websites is a 3 NPN direct coupling preamplifier, with around 1,000 times voltage amplification, shown left.

This schematic works and it is modified from what it is on the Internet. Many websites copied and re-copied from one to another with R5 as 680 Kohm and the power supply at 6 Volts. That particular combination simply does not work, because of improper biasing of transistors.

Also, even in this schematic, one should notice that the impedance is higher than in the previous preamplifier. Q1 is in common emitter configuration, and one can

estimate R4 as the input impedance. By using computer simulation one can find that even at 1 MHz (that is radio, not audio frequency) the amplification continues to be high, in the order of several hundreds. So, the computer simulation allowed me to confirm my doubts about keeping this preamplifier stable and ever using it. At the same time, it can be interesting to play with it, to see if indeed it can be stable and useful for something.

The above were examples with computer simulation that can save a lot of practical debugging. It is also fun to draw and simulate various electronics schematics just to experiment without ever touching any real component. One can say that the SPICE simulation is for schematics what EchoLink is for a QSO.

~ 73, Daniel VE7LCG



...the computer simulation allowed me to confirm my doubts



175th Anniversary of Morse Code

Newsweek reports Morse Code is 175 years old and still as useful as ever

The first message sent by Morse code's dots and dashes across a long distance traveled from Washington, D.C., to Baltimore on Friday, May 24, 1844 - 175 years ago. It signaled the first time in human history that complex thoughts could be communicated at long distances almost instantaneously. Until then, people had to have face-to-face conversations; send coded messages through drums, smoke signals and semaphore systems; or read printed words.

Thanks to Samuel F.B. Morse, communication changed rapidly, and has been changing ever faster since. He invented the electric telegraph in 1832. It took six more years for him to standardize a code for communicating over telegraph wires. In 1843, Congress gave him \$30,000 to string wires between the nation's capital and nearby Baltimore. When the line was completed, he conducted a public demonstration of long-distance communication.

There is a thriving community of amateur radio operators who treasure Morse code, too. Among amateur radio operators, Morse code is a cherished tradition tracing back to the earliest days of radio. Some of them may have begun in the Boy Scouts, which has made learning Morse variably optional or required over the years. The Federal Communications Commission used to require all licensed amateur radio operators to demonstrate proficiency in Morse code, but that ended in 2007. The FCC does still issue commercial licenses that require Morse proficiency, but no jobs require it anymore.

Read the full story at <https://www.newsweek.com/morse-code-175-years-old-useful-1432418>

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KB6NU's Column

Dan Romanchik, KB6NU

How to make Field Day (or any remote operation) a success

In the spirit of Field Day, we dig back into Dan's archives for this edition.

In my days as a radio broadcaster, one of the most exciting things we did was a "remote", where we took our gear and our talent out into the community to broadcast live. My good friend and legendary programming consultant, Gary Berkowitz, recently wrote a column about how to accomplish an effective remote. Realizing that Field Day, a Special Event Station, or any activity that takes ham radio into our community is an opportunity to promote our essential avocation, here's my recipe for excellent execution, borrowing heavily on his advice.

1. Have a plan - Weeks prior to this year's Field Day, I had the honor of attending the South Lyon Area Amateur Radio Club's monthly meeting. A good portion was dedicated to Field Day. They had a strong committee, headed by a strong and respected leader. They recruited a number of volunteers and had detailed plans for everything from set-up to food preparation. Sweat the details beforehand and the execution is more than half done.
2. Assign a welcome ambassador - Many years ago, in my role as ARRL Technical Coordinator for New Mexico, I visited a number of Field Day sites. I happened upon one at the same time as another ham. I naturally sought out who was in charge, but this other guy was more of an introvert. He wandered around the site for about 10 minutes, spoke to nobody and got in his truck. As he was about to pull away, he rolled down his window and sarcastically said, "thanks for making me feel so welcome." Part of your plan should include a trained welcome committee who welcome each attendee, with a special eye for newcomers. Recruit some younger members of your club to fill this role, too. A key to the sustainability of our hobby is our ability to entice the next generation to get involved. This is our chance to show off the most important aspect of what we do, friendly fellowship. People may come to check out the technology, but they stay because of the friendships.
3. Do a practice run before the real thing - This fall, we are launching the Great Lakes Ham Radio Convention at the Michigan International Speedway. The event naturally includes a Special Events Station - K8MIS. Members of our committee are using Field Day as an opportunity to test out gear we'll be using in October and to review operational ideas that we're considering. Before you get to the site, make sure your gear is in working order, including antennae, radios, computers, software, grilles, iceboxes, etc. Attention to detail here will minimize the chance of failure on the big day.
4. Promote, promote, promote - Do a creative email blast to, club members, friends and your local media, customizing the copy for each audience. Make use of your social media channels and do a count-down to Field Day to keep things front-of-mind. If your group has a Public Information Officer (PIO), make the rounds to local news organizations and service clubs. Have Powerpoints and videos prepared to make it easy for your partners to amplify your message. On Field Day, be well stocked with collateral describing your club, the ARRL and how to become a ham. Make sure your guests leave with their hands full of swag.

5. **Serve good food** - Nothing telegraphs summertime like the smell of hot dogs and burgers cooking on the grille. Create a sustenance committee that is responsible for feeding your volunteers and guests. Be creative, perhaps sharing the recipes you cook on fliers with information about the club. Bring lots of liquid. Especially if it's hot outside, hydration is crucial to comfort and safety.
6. **Get guests involved** - Every Field Day site should have a Get On The Air (GOTA) station, where visitors can try their hand at making contacts. The MSU Amateur Radio Club holds open shack nights throughout the year and the first thing we do after showing off the blinking lights is put a microphone in the visitor's hands. Nothing creates excitement like involvement.
7. **Operate** - Get your best operators on the rigs and hit it hard. Have a plan to maximize band conditions throughout the event. Set up times where newer participants can watch, learn and practice. Once you've decided which class of operation you'll be using, keep the rigs on fire all the time. This is practice for the real thing and in the event of a true emergency, the muscle memory will kick in and your club will add true value.
8. **Enjoy!** - The most important thing about any club activity is to create an environment where your participants can have fun. We promote ourselves as, and in fact we are, crucial partners in times of community need. To make



this happen, we need a cadre of engaged, dedicated and excited volunteers who not only know what they are doing, but love what they are doing. Field Day done right can be an annual celebration that everyone in your area, licensed or not, will want to be aware of and involved with.

It's impossible to cover every base in an essay of less than 1000 words. I welcome additional ideas, thoughts and feedback.

~ Dan KB6NU

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Learning about batteries

I often say that getting an amateur radio license is as much getting a license to learn as it is getting a license to operate on the amateur radio bands. Lately, I've been learning about batteries, LiPo batteries to be exact.

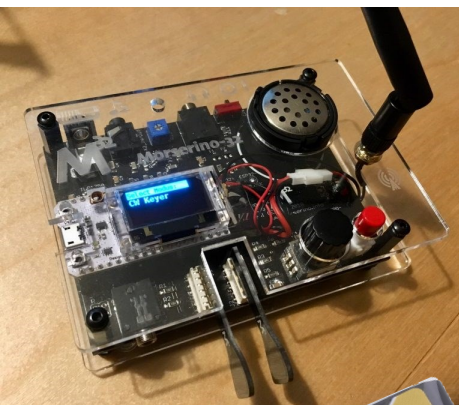
It all started when I purchased a Morserino (<http://morserino.info/>). The Morserino is a Morse Code learning aid that has a number of unique features. For example, in addition to helping you learn the characters, it's also supposed to help you learn how to copy in your head. It also has a built-

in touch keyer function, and a LoRa interface that lets you send and receive code from other Morserino units.

I'll be writing more about the Morserino in a future column, but let's get back to batteries.

The kit did not come with a battery. Instead, it was suggested that one purchase a 600 mAh LiPo battery commonly used for powering drones. I found this battery on Amazon, and purchased a six pack of them, thinking that I'd find uses for the other five in some project or another.

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Well, sooner than expected, I did find another application for one of the batteries. I'm building a little Arduino project for a client, and I reckon that this, or one with more capacity, will make a great power source for the project.

Now, I have two immediate challenges:

1. Figure out how to charge the battery.
2. Figure out how to connect it to the Arduino.

On the Morserino, the battery plugs directly into a connector on the bottom of the computer board (the white board with the LED display). I

knew that connecting the 5V line from the USB connector directly to the battery was a no-no, but I'd lent out the Morserino to a friend, and I didn't have the schematics for the board. So, how they managed to charge the battery from the USB port was a bit of a mystery.

I emailed Willi, OE1WKL, the designer of the Morserino, and he sent me a wealth of information. There actually is a battery-management IC, the TP4054, on the board [lower left]

He also gave me the part number for the battery's mating connector. He said, "The mating connector for the Molex connector on the battery is a Molex 51006. It is sometimes referred to by vendors as 51005 female, but 51005 is the connector on the battery." You can, of course, buy pre-made cable assemblies on Amazon

(<https://www.amazon.com/gp/product/B07P54QTR8>).

You can also buy lithium battery charging modules

(<https://www.amazon.com/gp/product/B01LZSC7I8>). These modules have a TP4056 on them, which is similar to the TP4054. It's amazing to me that you can purchase ten of these things for less than seven bucks.

So, that's where I'm at right now. Once I get the modules and cables, I'm going to hook it all up and get the Arduino system running from the battery. The next step will be to integrate a small solar panel and run the whole thing from solar power, hopefully.

~ Dan KB6NU
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When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.



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NEWTON	Maranatha Canadian Reformed Church <u>Surrey Amateur Radio Communications Operations & Training Centre</u> Surrey Operations Centre
SOUTH SURREY	Historic Stewart Farm SORCE Bike Club South Surrey Operations Centre Surrey Parks & Sunnyside Acres Heritage Society
WHALLEY	Central City Brewers & Distillers Chuck Bailey Recreation Centre City Centre Library Di Reggae Cafe Douglas College Training Group Sprite Multimedia Systems Ltd. Surrey Biofuel Facility Surrey City Hall Surrey Nature Centre Viva Care Medical Group

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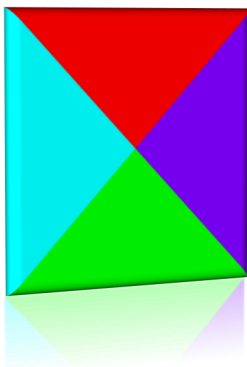
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Foundations Of Amateur Radio

VK6FLAB Onno Benschop

Episode 201—Fragility of Communication



*For the audio
podcast
Foundations of
Amateur Radio
visit the website:
[http://podcasts.itmaze.
com.au/](http://podcasts.itmaze.com.au/)*

Our day to day life is full of communication. We listen, although less and less, to the radio for news and entertainment, sometimes mixed together as food and games for the masses.

We can communicate with family, friends and the rest of the global population using a telephone. With the internet as a transmission medium, we exchange text, sound and vision with impunity to anyone who stumbles across it on a mind boggling collection of outlets, websites, social media, email, streaming services to name a few.

The vast majority of this kind of communication is a commodity, that means that with little or no training most of the population has access to this.

Another aspect of this commodification is that it's reliable. It works most of the time, it's generally good quality, with little or no loss, as in, you speak into your phone and there's an extremely high chance for the other party to hear your voice. While there are occasions that calls drop out, or the audio is chopped up, it's more an exception rather than a regular occurrence.

In stark contrast, amateur radio is none of those things. It's not a commodity, it's not reliable, it's a poor man's version of the ubiquitous mobile phone.

As amateurs we know why it's not the same, for starters, to make contact between say Perth and Bermuda using

amateur radio requires exactly two pieces of equipment. Your radio and theirs. Making this contact with a mobile requires that both ends have a phone. They'll also need a way to connect to the phone network, either a local base station or a telephone exchange, those in turn connect via many different ways to each other, including repeaters, relays, perhaps a satellite, a fibre optic cable or three, too many devices to count today. Extreme level of complexity.

I'm mentioning this because it's simple to conclude that amateur radio is obsolete, but it's just not true.

With the lack of reliability associated with an amateur radio connection comes something that is unique to society today. Thanks to reliable communication, we have come to expect that all communication is reliable, even our experimental hobby, but if you spend any time on air at all you'll quickly realise that for amateur radio, we need to conduct ourselves with protocol, using specific procedures, phonetics, structured phrases, callsigns and the like to overcome some of the aspects of unreliability.



Talking on the local repeater looks and smells like a mobile phone chat room, but it's not. It relies entirely on the participants collaborating to ensure reliable communication.

Similarly, calling CQ on HF, requires that you understand that the other station isn't on the end of a telephone connection and that parts of what you're saying are going to be missing at the other end. Using phonetics, speaking slower, waiting longer and monitoring, all assist with making contact.

If you're unsure about this, just listen in on a local net for regular confusion, or use an online receiver like WebSDR to hear what you sound like at the other end.

To make things a little more interesting, every amateur band has a different failure mode. On 20m from one breath to the next, the path might close, on 80m you might get overwhelmed by noise, on 40m you might find yourself all of a sudden sharing the frequency with another station, both of you blissfully unaware of the other's existence.

Communication in amateur radio is collaborative and there are common courtesy behaviours. If you're working a rare DX station, that's not a personal friend, don't start a whole conversation about your dogs, your medical issues, or the level of amazingness of your station. You're not alone in attempting to make the contact and they're not there for your personal enjoyment. Hogging the frequency is a sure fired way to acquire the ire of your fellow amateurs, especially in marginal conditions, where band conditions are rapidly changing.

There is nothing like getting your feet wet by actually getting on air and making noise, but when you do, remind yourself that this is not a telephone and it's not perfect. Be mindful of your on-air conduct and you'll find a globe full of friends.

~ I'm Onno VK6FLAB



Episode 179: The Golden Age of Amateur Radio is Now

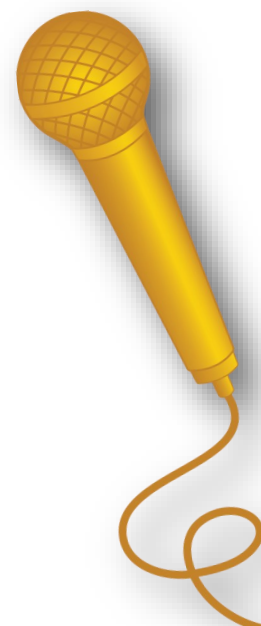
Imagine a world where electronics are pervasive, a transceiver can be purchased for the price of two Big Macs, kits are designed and built using simple tools at home, software makes it possible to invent new methods of communication on an almost daily basis, where long distance contacts are made throughout the day using milliwatts while ionospheric propagation is at an all-time low, where national parks and peaks are being activated at an increasing rate, where new people join in every day, where it's easier and easier to obtain a license and where the word geek is held as a badge of honour.

That world is here, it's now and when Rex, KE6MT writes that we're in the midst of a golden age of amateur radio, he hits the nail on the head, or should that be fist on the key?

It's easy to notice that amateur radio is difficult, that it's big, that it's messy, that it's full of know-it-alls, but it's hard to remember that it's fun, that it's rewarding and that every day more and more people join in and enjoy this hobby. The ideals of investigation and exploration are alive and well and the urge to participate in activities, just to get out of the house and see some daylight is strong.

While you're in the midst of a revolution, it's hard to see the wood for the trees, but make no mistake, the revolution is here, today, now, and you're smack bang in the middle of it.

Today you can go online and find any number of different amateurs who share their skills and knowledge, you can find manufacturers and suppliers at the tap of a screen, find and draw schematics, order custom circuit boards at the click of a check-out button, print an enclosure in



June 2019

To listen to the podcast, visit the website: <http://podcasts.itmaze.com.au/foundations/> and scroll to the bottom for the latest episode. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: <http://amazon.com/author/owh>.

Foundations of Amateur Radio Volume 7 is out now - with chapters on digital modes, coax connector loss, waterfalls, station performance and more.

Feel free to get in touch directly via email: onno@itmaze.com.au, or follow on twitter: @vk6flab (<http://twitter.com/vk6flab/>)

If you'd like to join a weekly net for new and returning amateurs, check out the details at <http://ftroop.vk6.net>, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link and 2m FM via various repeaters.

ITmaze -ABN: 56 178 057 063

phone: 04 1219 8888
onno@itmaze.com.au

your bedroom using plans that you downloaded or designed minutes before.

With the digitisation of amateur radio comes the promise of new adventures, with adaptive modes, with encoding and decoding in new and interesting ways, with the ability to hear what your station is producing by logging into a remote receiver anywhere on the planet, by sending messages to satellites overhead and talking to people in another country using a hand-held VHF radio.

For some the loss of the valve radio is the loss of history, for others it's a sign of progress and improvement. The inventors of spark-gap transmitters were no doubt put out by the arrival of the valve when that became commonplace. Similarly, the transistor has essentially gone the way of the Dodo in the arrival of cheaply programmable integrated circuits.

Our hobby keeps getting bigger, all the time.

We didn't abandon valves or transistors, or the spark-gap for that matter, we improved on them. You can still build a spark-gap transmitter if you feel the urge, or ferret out a valve or two and build them into something wonderful, nobody is stopping you.

Today we learn Morse Code because we want to, not because we have to.

We introduce new people with new technology, new ideas, new innovations and hope that they pick up the cape to become the next superhero.

You can bemoan the death of the hobby with the solar cycle at an all time low, the entry of stupid amateurs who need to learn from their betters, the passing of the valve and the abolition of Morse Code requirements, or you can celebrate the appearance of all the new and shiny toys that arrive in our hobby every day.

The Golden Age of Amateur Radio is Now.

~ I'm Onno VK6FLAB

The 'State of the Hobby' Survey

This survey started out in 2017 as nothing more than simple curiosity. While browsing the Amateur Radio subreddit the author noticed several survey requests for highly specific topics. Yet often found himself wondered what the results were. It was then the State of the Hobby was born, acting to collect opinions on topics that impact amateur radio and those who participate. A critical goal of the survey is to make those results widely available for the entire community - and perhaps encourage operators to make changes in issues areas or continue doing what seems to be working! If these results bring even small changes, it was worth it.

This survey is important for a few reasons. First we need data independent from regulatory and commercial bodies about the topics that impact us. Second, this survey is a benchmark to help determine what is working and what is not in the ham radio community. This can involve participation, recruitment, mentoring and licensing. It can also help identify new and emerging trends in amateur radio.

[2017 Survey Results](#) | [2018 Survey Results](#)

[2019 Survey Results](#)



The Langley MS Walk

On Sunday, May 26 members of SARC joined with the Langley Amateur Radio Association to provide communications and volunteer support to the annual Multiple Sclerosis (MS) Walk. This is a fund-raiser for MS research and participants run, jog, or walk either the 1.5 or 3 km route.



Multiple sclerosis can strike anyone at any moment, and Canadians have one of the highest rates of MS in the world. Joining MS Walk means being involved in a community that is driven to improve the lives of those affected by the disease. The funds raised at MS Walk are invested in accelerating the pace of MS breakthroughs and empower people with MS to live their best lives.



Families and friends shared in the start/finish-line activities, team awards ceremonies and amazing stories from people living with MS!

To join the walk next year visit the MS Walk Langley Page -

[CLICK HERE](#)



June 2019



Tidbits from the Amateur Radio World

Ham Radio Gaining New Support In The Digital Era

ATLANTA - Seeking reliable backup communication in a crisis, emergency managers are finding new solutions in an old technology: ham radio.

"It's just another avenue, another opportunity for us to be able to communicate," said Herb Schraufnagel, public safety captain with Emory University Hospital Midtown. Emory HealthCare is among a growing number of hospital systems to adopt ham radio. Hospital administrators and government officials took a lesson from Hurricane Katrina, which left some Gulf Coast medical centers isolated from the outside world, as landlines and cell towers failed.

When power, phone and Internet services go down, a battery-powered amateur radio and portable antenna can provide that crucial link to the outside world. "Ham radio will never die," said Barry Thomas, Sr., a ham radio enthusiast and employee at Emory University Hospital Midtown. "The quickest means of communication is Morse Code. It'll get out when none of this will," Thomas said, referring to a room filled with computers and smartphones.'

"It is interesting that some of the technology that has been around for 80, 90, 100 years is still relevant," said John Davis, a ham radio enthusiast. In addition to major hurricanes, Davis says the terrorist attacks of September 11, 2001 rekindled interest in ham radio as a public safety tool.

The Georgia Emergency Management Agency (GEMA) has set up a permanent ham radio station in its command center. "We look at ham radio operators just like GEMA staff, just like DOT staff and Georgia State Patrol staff," said GEMA Director Charlie English.

"They are a critical partner with us."

The number of ham radio licenses is at an all-time high in the U.S. (723,182, as of April, according to Federal Communications Commission (FCC) data compiled by Joe Speroni of the Amateur Radio Education Web Site, ah0a.org.

"I really hope that it stays relevant and that we can be a resource to emergency management agencies," enthusiast Davis said. "Because I think that is where ham radio shines."

~ Fox News

Click on the image below
to view the video





No-Ham Recipes

Field Day BBQ Burgers

INGREDIENTS

Per 4 burgers:

- 1 lb. ground beef
- Kosher salt
- Freshly ground black pepper
- 3 tbsp. extra-virgin olive oil
- 2 tbsp. sweet chili sauce
- 1 tbsp. honey
- 1 tbsp. sriracha
- Juice of 1 lime
- 1/3 c. mayonnaise
- 2 c. slaw
- 4 hamburger buns

DIRECTIONS

Form beef into patties and season all over with salt and pepper. In a medium bowl, whisk together oil, sweet chili sauce, sriracha, honey, and lime juice.

In a separate bowl, combine half the chili sauce mixture with the mayonnaise. Reserve remaining sauce for basting on burgers.

Heat a grill pan, large skillet, or grill over medium-high heat. Add burgers and grill until charred, about 4 minutes. Flip and cook until cooked to your liking, about 4 minutes for medium, basting the burgers with the sauce throughout the process.

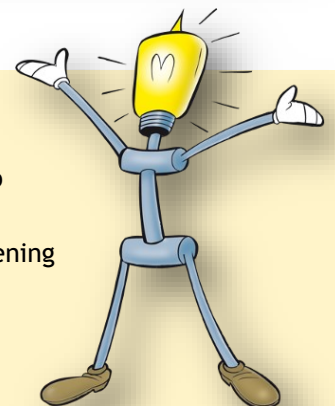
Place burgers on bottom buns and top with slaw and drizzle with mayonnaise mixture. Replace top buns and serve immediately.



Information About RF Connectors

There are a number of commonly available RF connectors that are used with coaxial cable to provide screened connections. These coaxial cable connectors are used in a number of areas whether to carry RF or radio frequency signals or just to provide a much higher level of screening than would be possible if more ordinary "open" connectors were used.

https://www.electronics-notes.com/articles/electronic_components/rf-connectors/coax-cable-connectors.php



June 2019



Field Day 2019: June 22-23



2019-05-23 BY ALAN GRIFFIN

Field Day is always the 4th full weekend in June and this year's event will be held on Saturday, June 22 and Sunday, June 23.

The American Radio Relay League / Radio Amateurs of Canada Field Day is held annually during the fourth full weekend in June, beginning at 1800 UTC Saturday and running through 2059 UTC Sunday.

Sponsored by the ARRL and RAC (but organized primarily by the ARRL), Field Day is open to all Amateur Radio operators covered by these two International Amateur Radio Union (IARU) member organizations.

The following information is courtesy of the Field Day Wikipedia site:

"Field Day is an annual Amateur Radio exercise, widely sponsored by International Amateur Radio Union (IARU regions) and member organizations, encouraging emergency communications preparedness among Amateur Radio operators.

Since the first ARRL Field Day in 1933, Radio Amateurs throughout North America have practised the rapid deployment of radio communications equipment in environments ranging from operations under tents in remote areas to operations inside Emergency Operations Centres (EOCs). Operations using emergency and alternative power sources are highly encouraged, since electricity and other public infrastructures are often among the first to fail during a natural disaster or severe weather.

To determine the effectiveness of the exercise and of each participant's operations, there is an integrated contesting component, and many clubs also engage in concurrent leisure activities (camping out, cookouts, etc.). Operations typically last a continuous 24 hours, requiring scheduled relief operators to keep stations on the air. Additional contest points are awarded for experimenting with unusual modes, making contacts via satellite, and involving youth in the activity."

The following information is courtesy of the American Radio Relay League's Field Day site:

"Field Day is the single most popular on-the-air event held annually in the US and Canada. On the fourth weekend of June of each year, more than 40,000 Radio Amateurs gather with their clubs, groups or simply with friends to operate from remote locations.

Field Day is a picnic, a campout, practise for emergencies, an informal contest and, most of all, FUN! It is a time where many aspects of Amateur Radio come together to highlight our many roles.

While some will treat it as a contest, other groups use the opportunity to practise their emergency response capabilities. It is an excellent opportunity to demonstrate Amateur Radio to the organizations that Amateur Radio might serve in an emergency, as well as the general public. For many clubs, ARRL Field Day is one of the highlights of their annual calendar.

The contest part is simply to contact as many other stations as possible and to learn to operate our radio gear in abnormal situations and less than optimal conditions. We use these same skills when we help with events such as marathons and bike-a-thons; fundraisers such as walk-a-thons; celebrations such as parades; and exhibits at fairs, malls and museums - these are all large, preplanned, non-emergency activities.

But despite the development of very complex, modern communications systems - or maybe because they ARE so complex - Amateur Radio has been called into action again and again to provide communications in crises when it really matters. Radio Amateurs are well known for our communications support in real disaster and post-disaster situations.

Don't forget to follow Field Day via Twitter using #ARRLFD and #RACFD and share your stories with RAC on Facebook at <https://www.facebook.com/radioamateurscdn>.

For full Field Day rules and details, please visit the [ARRL website](#). Have fun!

QRT

Robert Fishwick VA7FMR

CW And Me

I think that most new Amateur Radio licensees think of CW at one time or another, I know that I did, since I could hear the elusive dits and dahs at the lower end of the 20 Meter band.

During my life experience, I have often been exposed to this most interesting way of communicating. During my time in the military I was often within eye and ear distance of a very experienced keyer and I always thought how great it would be if I too could “talk” to someone in Dits and Dahs. In my first year as a Ham I was introduced to contesting by John Brodie VA7XB, first at his wonderful radio shack at his home, and then at the OTC radio room. His patience and great teaching got me hooked, first using voice and then a great addition to my knowledge, Digital, as in RTTY. I have found that there are a lot of areas within our hobby that can be both interesting and in many ways, downright difficult.

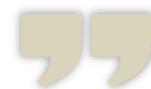
In order to make my computer, running N1MM+ and my radio talk to each other in a digital way, I had to install FLDIGI and MMTTY. It was during the setup of each of these items, Computer, Radio, FLDIGI, MMTTY and N1MM+ that I found that N1MM+ could send CW. Wow, that was a big eye opener but what about decoding the CW message?

Off I went to my trusty Google search engine and found tons of material regarding decoding the Dits and Dahs that I was trying to learn. On YouTube I even found extensive material about key savvy contesters using the function keys on their computer to send CW during their time contesting.

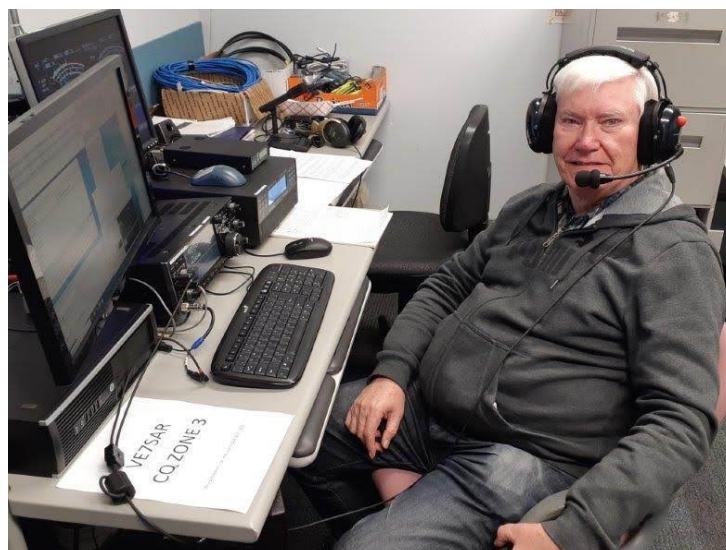
There were lots of decoders that claimed to be the “Best” including one from Europe somewhere with a hefty 40 or 50 Euro price tag. This software had a 30 day trial period, so I downloaded it with four others for a total of five. I started them all running on my computer, all on the screen at the same time and tuned in to a decent CW station. I started finding weaker and weaker stations and found that they all dropped letters at about the same time.

During these tests, I found that N1MM+ also has a decoder using FLDIGI running MMTTY as the engine. I started The N1MM+ decoder and compared it to the other five and, to my surprise, it decoded better than the others by a big margin, even beating the 50 Euro software by quite a large amount.

I now had all of the tools I needed to enter a contest using the means I had found. I spent many evenings testing what I had found and not surprisingly, I had quite a long learning curve ahead of me. I decided to set my transmit speed to 20 words a minute, not too fast for the beginner and not too slow for the aficionado. I now had to learn how to tune in the signal on the waterfall display and how to use filters to isolate one signal from another. I eventually found



N1MM+ also has a decoder using FLDIGI running MMTTY as the engine.



June 2019

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the sweet spot on the waterfall and the signal strength meter showed an immediate jump up the scale. I listened to and read many messages for several weeks tweaking and learning how to use the interfaces until I felt I had enough confidence to give what I had a try.

I was tuning in the CW zone of the 20 meter band and heard a station calling CQ. This was not a contest. I sent my call sign and held my breath. He actually heard and answered me. I brought up the keyboard part of the software and started to type his signal strength at my station and my location. I also told him that he was my first contact using CW. He replied with my signal conditions and he told me that he was happy to be my first contact. What a rush! I was more than happy.

The following weekend had a CW WW Contest. I set up my category in N1MM+ as a "Single radio, single operator, Single band, 100 watts output". On the first day I operated for about 5 hours, about the same the next day. I sent in my Log Book and waited for a few weeks and went to the contest Web page to find that I had been awarded a certificate as the winner in my Category.

I am over 80 years young and I am trying to learn CW but at my age, I have a terrible short term memory. One day I will run my key coder software and learn several characters but by the next day, several have flown the coop. It is taking me much much longer to learn code than it would have done when I was in my younger years, and I regret that sincerely. I have, however, discovered the tools that enable me to enjoy our hobby in a very satisfying way, opening up a section of the hobby that gives me a great deal of satisfaction and pleasure.

I do not think I can beat that.

Enjoy the summer.

~ Robert Fishwick VA7FMR.

As mentioned in John Brodie's 'Contest Contender' column in this publication, I tried the 'Fishwick CW Method' during the WPX CW contest on the weekend of May 25-26. It worked!

I achieved my Morse code qualification early on in my Amateur Radio journey, when it was not part of the Basic and Basic with Honours exam but I have not kept up with it. Some characters remain in my memory but, due to advancing age and FIFO (First In—First Out) others are difficult to recall when monitoring the CW bands.

While editing this issue and reading Robert's piece, I became more curious. Having the same IC-7300 and using N1MM+ for contesting, I thought that I would give it a try. Robert made it all sound pretty simple. I hooked up everything as I thought it should be and tuned to a strong CW signal. Thankfully, due to the on-going contest, there was plenty of choice. The CW monitoring software sprang to life and legible characters began to appear. Hmmm... why is there a constant audible series of dits coming from my radio speaker, in addition to the CW audio? The radio was not transmitting but the dits were clearly heard.

I visited Google for an answer but none was forthcoming. Judging from the search results, there were plenty of folks who had done this previously. None mentioned my problem. Time to review the iCom manual as a last resort. The Communicator has a deadline and I was spending more time on this than intended. There are several CW settings on the IC-7300 and I reviewed them all—no luck with my phantom dits though.

By chance I disconnected my headset and foot switch. It stopped! Then plugged everything in again... When I plugged in the foot switch the dits started up again. It turns out that the plug is wired for stereo, one channel for dits and one for dahs. I left it unplugged.

I made 6 contacts in short order. I can confirm it... The 'Fishwick CW Method' works.

~ John VE7TI



It's June

June is the month when we wrap up another Amateur Radio year. It's been great but there is some unfinished business.

This is a busy event month with Surrey Doors Open (June 8), our Annual General Meeting (June 12) and on July 1st the Canada Day celebrations and RAC Canada Day contest. Even if you do not actively participate, please come out and support these events.

We hope to see you through the summer at our OTC social meetings in lieu of the regular general meeting. Have a great summer and we will start another season in September.

Down The Log...

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hr at the PREOC
Emergency Mgmt BC
14292 Green Timbers
Way, Surrey, BC

Weekly SARC Breakfast

Saturday between 0800
and 1000 hrs at the
Kalmar Family Restaurant
8076 King George Blvd.
Surrey

SARC Net

Tuesday at 2000 hr local
on 147.360 MHz (+)
Tone=110.9

SEPARS Net

Tuesday at 1930 hr local
on 147.360 MHz (+)
Tone=110.9

VE7RSC Repeaters

2m: 147.360MHz+
Tone= 110.9Hz
IRLP node 1736
Echolink node 496228

1.2m: 223.960 Mhz -1.6
Tone=110.9

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

	SARC Net 20:00 Hrs
1 st Tuesday Standby	Drew VA7DRW Dixie VA7DIX
2 nd Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3 rd Tuesday Standby	Rob VE7CZV Vacant
4 th Tuesday Standby	Kapila VE7KGK John VA7XB
5 th Tuesday Standby	Robert VA7FMR John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	



We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is \$4 each or three for \$10 and they can be picked up at a meeting or the weekly Koffee Klatch.

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